EVALUATION OF NURSING STUDENTS' ACADEMIC EXPECTATIONS, PERCEPTIONS AND EXPERIENCES OF SCIENCE AT DIFFERENT STAGES DURING THEIR UNDERGRADUATE STUDIES

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Statement of Authorship and Resources

No parts of this thesis have been submitted towards the award of any other degree or diploma in any other tertiary institution.

No other person's work has been used without due acknowledgement in the main text of the thesis.

The research procedures reported in the thesis received the approval of ACU Human Research Ethics Committee.

Hemant Mehta 04/04/2011

This research project is dedicated to my
Nursing students of past, present and future

Intense love does not measure, it just gives.
- Mother Teresa

Spirit of love is spirituality...
If there is righteousness in the heart,
there will be beauty in the character;
if there is beauty in the character,
there will be harmony in the home;
if there is harmony in the home,
there will be order in the nation;
if there is order in the nation,
there will be peace in the world.
- Anonymous

Do not then train youths to learning by force and harshness, but direct them to it by what amuses their minds so that you may be better able to discover with accuracy the peculiar bent of the genius of each.
- Plato

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Abstract

At the Australian Catholic University (NSW), expansion of the undergraduate nursing program in response to a worldwide shortage of nurses resulted in increased student enrolment and accelerated diversification of the student population during the study period, 2005 to 2009. A primary focus of this investigation was to develop a better understanding of this nursing student population, and evaluate the impact of rapid unplanned change on the academic environment by exploring students' changing expectations, perceptions and experiences of science during the BN course. The research design combined a horizontal three year study with a three year longitudinal investigation. The repetitive horizontal approach provided snapshots of student perceptions and experiences, while the longitudinal study evaluated changes over the study period. A mixed methods approach was adopted utilising questionnaire surveys, focus group discussions and one-to-one interviews. Data from a total of 1448 survey responses (85% females), 10 focus group discussions (74 students) and 33 student interviews were analysed.

Increasing numbers of international, mature-aged and male students from diverse cultural, linguistic, educational, socio-economic and occupational backgrounds comprised the BN population during the period of study. Combined with technological advances, this created a unique learning environment. The first year BN cohorts consisted of approximately 80% mature-aged (>21 years) students and up to 55% international students. Having chosen the nursing profession for reasons of ample work opportunities, job security and altruism, 38% found tertiary studies more challenging than originally expected. In particular, 195 survey respondents (88.5% female students, 78.8% mature-aged, and 68.6% from non-English speaking backgrounds, NESB) in the three successive first year cohorts reported difficulty with learning science. Some students, especially males who felt isolated, stated that they initially felt uncomfortable and lacked confidence. Over 60% of students in each year of the course reported difficulty in balancing study and work, and many felt the pressures of family and other commitments. Of the first, second and third year students who worked for pay, over 40% worked in

excess of 15 hours per week. Regardless of background, over 80% of the students surveyed felt competent in using electronic technology for learning. However, English language expectations posed a barrier to effective learning with 65% of respondents believing that progress in English language would benefit their studies. Many (44.4% Yr 1, 49.8% Yr 2, 62.7% Yr 3) students were able to cope with the complexities of learning science by developing active learning strategies and positive study behaviours. Students considered the collective use of various teaching modes effective, stating that there should be no reduction in content or omission of any particular instruction mode. While progressing from first year to third year of the BN course, the proportions of students perceiving science to be "interesting" increased from 48.9% to 53.2%. In each of the three years of the BN course, over 95% of participating students realised the value of science and its significant role in nursing practice, and over 81% considered the science units to integrate well with nursing and clinical units. Students desiring more science in the BN course increased from 7.1% (8 ESB, 28 NESB) of first year respondents to 17.6% (20 ESB, 61 NESB) of third year.

As a consequence of globalisation, internationalisation and technological advances at this critical time of increased demand for skilled graduates, the characteristics of a typical student at an Australian university are hard to define. However, the student population in this study was relatively homogeneous with respect to learning behaviour and perceptions of science as all students identified with and worked towards a common goal. Results of this study contravene the misconception that students dislike science, and provide a unique insight into diverse undergraduate nursing students' academic expectations, perceptions, and experiences in the dynamic learning environment of the early 21st Century.

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List of Abbreviations

ACU	Australian Catholic University
ANZAME	Australia and New Zealand Association for Medical Education
ASCILITE	Australian Society for Computers in Learning in Tertiary Education
CALD	Culturally and linguistically diverse
df	Degrees of freedom
e.g.	Exempli gratia (Latin, meaning "for the sake of example")
ESL	English as a Second Language
et al.	Et alii (Latin, meaning "and others")
FoHPE	Focus on Health Professional Education
HERDSA	Higher Education Research & Development Society of Australasia
IBL	Inquire-based learning
ICT	Information and Communications Technology
i.e.	Id est (Latin, meaning "that is")
IELTS	International English Language Testing System
LMS	Learning Management System
n	Sample size (statistics)
NESB	Non-English speaking background
NSW	New South Wales
p	Probability
pp.	Pages
PBL	Problem-based learning
SDL	Self-directed learning

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Chapter 1

Introduction

Chapter 1: Introduction

Education of competent nurses is pivotal to the health and well being of society. It is widely accepted that nurse competence depends on knowledge in a range of disciplines, including science. In recent years, undergraduate nurse education has been undergoing significant changes due to an increased need for nurse graduates in the workforce. The pressures arising from the rapid enlargement of student cohorts and consequent heterogeneity include difficulties adapting to university, learning science, developing effective study habits, and high attrition from undergraduate courses.

1.1 Background to the study

Biological and clinical sciences are an essential component of the nursing curriculum in undergraduate courses in Australian universities, their importance in nurse education being widely accepted (Friedel & Treagust 2005; Thalluri et al. 2005; Gresty & Cotton 2003; McKee 2002). Subjects such as anatomy, physiology, pathophysiology, pharmacology, and microbiology provide the scientific underpinning for nursing practice. The knowledge of science enables understanding of clinical cases and their treatment modalities, and informs nursing assessments and interventions (Thalluri et al. 2005; McKee 2002). An understanding of science is vital for nurses in the light of the ongoing developments in technology and therapeutics, and because nursing roles have become more complex and demanding (Friedel & Treagust 2005; Prowse 2003a). In many countries, graduate nurses are expected to be autonomous practitioners who make decisions about patient care and safety (Van Achterberg et al. 2008; Friedel & Treagust 2005). Adequate science education is crucial for nurses as it prepares them for the delivery of effective, evidence-based care in the current, complex healthcare environment (Van Achterberg et al. 2008; Meleis 2005).

Science education has been a source of difficulty and anxiety to many nursing students (Thalluri et al. 2005; Jordan et al. 1999), particularly those with a poor science background (Gresty & Cotton 2003; McKee 2002; Jordan et al. 1999), and those who have poor perception of the relevance of science to nursing practice

(Caon & Treagust 1993). Previous Australian studies have shown a strong association between positive perceptions of the value/relevance of science and successful academic performance in science units (Andrew & Vialle 1998; Caon & Treagust 1993), without taking into account the rapid changes that affected the nursing education environment in the early 21st Century.

In the 21st Century, a worldwide shortage of nurses (WHO 2006; Orlovsky 2005) has occurred due to factors such as a diminishing supply of new talent entering the profession, and a growing demand for healthcare from the ageing population in the Western world (Cameron et al. 2010; Hirschfield 2009; UN Report 2005; Bosco et al. 2001; Hopkins 2001). In addition, the global nursing workforce is ageing with the large number of "baby boomers" due to retire from the profession in the coming decade (Drury et al. 2009; Erickson & Grove 2007). The nursing shortage will have far-reaching implications for the future because "it is also a shortage of nurse scientists who are developing the science that is essential for improving the quality of care" (Meleis 2005).

The current and growing shortage of nurses is a global concern (Samb et al. 2007; WHO 2006; Orlovsky 2005; Nugent et al. 2004), and nursing recruitment and retention are recognised national and international priorities (Price 2009; Kilpatrick 2007). The shortage of qualified health professionals, including nurses, is one of the largest barriers to achieving the Millennium Development Goals (Millennium Development Goals Summit 2000) for improving the health and well being of the global population, particularly the goals of saving lives of 16 million women and children (through better nutrition, antenatal care and disease prevention measures) by 2015 (Anand & Barnighausen 2004; Millennium Development Goals Summit 2000). In response to the nursing shortage, the International Council of Nurses (ICN) launched the Global Workforce Project in 2004, and the World Health Organisation (WHO) announced the decade of the Health Care Workforce 2006-2015 (WHO 2006; ICN 2004). These initiatives were global efforts to strengthen and expand the health workforce by training new people, to make more efficient use of the current pool of human resources for health, and to retain skilled staff (Samb et al. 2007; WHO 2006; ICN 2004).

The Australian Government responded to the local shortage of practicing Registered Nurses (RNs) by offering financial incentives for qualified nurses (who were either unemployed or working in non-health related jobs) to return to nursing practice (Drury et al. 2009), and funding additional places and resources for undergraduate nursing students in university nursing courses between 2002 and 2008. In addition, the Australian Government approved the issuing of more Student Visas to international students. Furthermore, entry standards were modified by tertiary institutions to increase intake into preregistration nursing courses. Consequently, there has been increased accessibility of nurse education for a wide range of students, including international, mature-aged, and increasing numbers of male students. The growth of international student numbers in vocational courses such as nursing has added an entire new dimension to the dynamics of diversity in the tertiary environment (McInnis 2003). It is widely acknowledged that a multicultural nursing workforce is needed to meet the needs of the multicultural population (Wilson et al. 2006; Shakya & Horsfall 2000; Klisch 2000). Due to the impetus to increase student numbers in Bachelor of Nursing (BN) courses, Australian academics have been teaching increasing numbers of nursing students of diverse age, ethnicity, and educational and socio-economic backgrounds. Nursing student populations also include experienced Enrolled Nurses (ENs) wishing to upgrade their qualifications to become Registered Nurses (RNs), and internationally qualified nurses desiring to gain registration in Australia. In NSW, the increases in enrolments in nursing pre-registration courses and in the nurse workforce are occurring in metropolitan areas, rather than in rural and remote areas (Kilpatrick et al. 2007; Nugent et al. 2004).

Increasing numbers of international students are studying in Australia (Drury et al. 2009; ACU 2008; ABS 2007; Asmar 2005). Popular disciplines include vocational courses such as nursing and business (Drury et al. 2009; ABS 2007). Full-fee paying overseas students are an important revenue source for Australian universities. Between 1995 and 2005, the growth in the proportion of full-fee-paying overseas students has been one of the most significant changes to occur within the Australian higher education system (Krause et al. 2005). Education services provided in Australia to international students generated an income in excess of $9 billion in the financial year 2004-2005 (ABS 2007). International

students spent almost $3.8 billion on fees (up from $1.8 billion in 2000), with 67% of this spent in the higher education sector. Expenditure on goods and services ($5.3 billion) was more than double that in 2000 ($2.2 billion). The growth of international student numbers in vocational courses such as nursing has added an entire new dimension to the dynamics of diversity in the tertiary environment (McInnis 2003). The expansion in nursing enrolments, both local and international, between 2004 and 2008, and the resulting increase in diversity of student populations, is manifest in nursing degree programs offered at the Australian Catholic University (ACU) and many other universities in Australia.

Nurse education, in many countries including Australia, has changed much in recent decades, and continues to do so (James et al. 2011; Thalluri et al. 2005; Kevern et al. 1999), in that cohort size is increasing and student populations are becoming increasingly diverse. The expansion of Bachelor of Nursing (BN) programs at Australian universities has led to many first generation students attending universities (Torner 2010; Henderson et al. 2009; Rudel 2006; Bellack 2004; McInnes 2003). Most commencing nursing students in Australian universities are faced with many challenges during their transition to university life (Mehta et al. 2008; Krause et al. 2005). These challenges include large student numbers on campus, students' diverse academic and cultural backgrounds, acquisition of independent study skills, adaptation to flexible course delivery methods, difficulties with assimilation of diverse teaching styles and scientific technologies, and fear of learning and acquisition of science content (Mehta & Robinson 2010; Robinson et al. 2010; Mehta et al. 2008). The prospect of learning the complexities of science may overwhelm nursing students who have had a long gap in their studies or not completed high school, and those with a predominantly person-centered focus who desire client contact and have little knowledge of, or interest in, science. In addition, home-sickness and domestic responsibilities may impact on the learning experiences of international and rural students.

Internationalisation and diversification of student cohorts represent a challenge to tertiary institutions, which are required to meet the varied needs of increasingly diverse student populations (Tinto 2008; Asmar 2005). Cultural diversity of student (and staff) population enriches all aspects of academic and social life and

encourages approaches to teaching and learning that are relevant to the increasingly global academic environment (University of Melbourne 2010). There is growing awareness that teaching strategies that do not engage or integrate diverse student populations are inadequate (Tinto 2008; Biggs 1999). Catering to the needs of international students has the potential to foster cross-cultural awareness and facilitate teaching innovations that will benefit both international and Australian students (Australian Government 2008). According to the Australian Government Discussion Paper (2008), higher education institutions need to focus on internationalising the delivery and content of courses in order to improve student experiences and outcomes, especially in nursing courses where international students and those from linguistically diverse backgrounds often outnumber local students.

The Australian Catholic University (ACU) is a popular choice for many Australian and international students, being a public university open to students and staff of all beliefs. It is Australia's larger Catholic university offering programs in five faculties (Arts & Sciences, Business, Education, Health Sciences, and Theology & Philosophy) in Australia and overseas. ACU is one of the largest providers of the Bachelor of Nursing programs in Australia. Since 2004, the first year BN cohort size at ACU (NSW Campus) almost doubled to 500-600 students (ACU Statistical Digest 2010). This increase was due to the relaxation of entry requirements and increased enrolments in response to increasing demand for nurse graduates (Wright & Gollan 2008; Nugent et al. 2004). The resulting heterogeneity in the enlarging student population represented a unique situation: high numbers of students learning together in a rapidly changing, blended and technologically enriched tertiary learning environment. Nursing student cohorts represented wide variations in ethnicity, life experiences, abilities, socio-economic and personality characteristics. Academics face the challenges of motivating, engaging and, thus retaining, the high numbers of diverse students. With conflicting demands on time (having to balance study, family, paid work, and social life), many students struggle with nursing studies.

Although nursing student populations have been widely investigated, the effects of unplanned ad hoc changes on the experiences of learning science in the unique

and dynamic, technologically advanced, academic environment of 21st Century have not been previously investigated. Earlier studies on nursing students have examined: career aspirations and reasons for choosing nursing (Muldoon & Reilly 2003; Bosco et al. 2001; Hemsley-Brown & Foskett 1999; Marsland et al. 1996), first year experiences of learning science (Dzurec et al. 2007; Thalluri et al. 2005; Fisher et al. 2002), reasons for attrition (Stott 2007, 2004; Wilson 2005; Pearce 2004; Elliott 2002), and preferred learning styles (Wehrwein et al. 2007; Lujan & DiCarlo 2006; Entwistle & Peterson 2004; Fleming 1987).

The use of electronic technology has advanced significantly in recent years resulting in increased course access for heterogeneous student cohorts (Glass & Sue 2008; Cuthrell & Lyon 2007). Technology has played an important role in assisting learning and teaching through e-learning (Krause et al. 2005; Eklund et al. 2003; Arsham 2002), and has made education more accessible (Gabbert & Sims 2007). However, advances in technology have not made learning science much easier (Keasar et al. 2005). Furthermore, not all students have adequate information and communications technology (ICT) skills or have been ready for the advances in electronic technology - some students from developing countries and some mature-aged nursing students have had very little, if any, previous exposure to computers (McMillan 2007; Fleming & McKee 2005). Mature-aged students represent a large group with much variation in ICT skills (Dearnley et al. 2006), which are essential for tertiary nurse education as students are expected to use computers for study. The combined effect of rapid and dynamic advances in technology and increased student diversity on students learning nursing science has not been fully investigated before.

Attrition (also described as "wastage" or "dropout" by Andrew et al. 2008) refers, in this study, to those students who leave at any stage of the preregistration nursing course without graduating. Given the global nursing shortage, the ageing nursing workforce, the expense of tertiary education, and the difficulty in attracting young (school-leaving age) people (Drury 2009), particularly males (Stott 2007, 2004), attrition from nursing courses is problematic. Nursing is a challenging vocation, which alone might be a cause of attrition. Over the last two decades worldwide, there has been much variation (7-55%) in reported attrition rates from nursing

courses (Gaynor et al. 2008; BBC News 2006; Pearce 2004). Attrition statistics for BN courses in Australia are similar to those for the UK, USA and Canada (Andrew et al. 2008). Furthermore, Andrew et al. (2008) point out that the attrition rates in Australian undergraduate courses are far greater in the first year than in subsequent years.

In previous studies, students who have withdrawn from nursing preregistration courses have stated reasons such as family or work commitments, emotional or physical health (Krause et al. 2005), or the difficulty in learning science (Andrew et al. 2008; Harvey & McMurray 1997). The higher failure rate in science units may thus be a contributing factor to attrition from the nursing course. Students may experience hardship in learning science subjects such as pathophysiology and pharmacology (King 2004; Bullock & Manias 2002) if insufficient time is allocated to assimilate large science content (Jordan et al. 1999) or if a theory-practice gap exists due to inadequate understanding.

In this era of nursing shortages, and at a time when the nurse workforce remains predominantly (>80%) female, 50% of the population (i.e. men) can no longer be ignored in nurse recruitment programs (Williams 2002, cited in Wilson 2005). Men entering nursing schools face many challenges (Ierardi 2010), and up to 55% of beginning male nursing students have been reported to either drop out, fail or transfer to other courses (Stott 2007, 2004; Wilson 2005). Attrition of male students is probably not directly linked to the study of science as many male students may accept the need for science and find it easier to learn than do some female students. Beginning male nursing students experience nursing schools as places where gender is a significant determinant of the educational environment and where feminities are predominant (Kermode 2006; Anthony 2004). They must cope with potential social isolation and gender stereotypes (according to traditional societal stereotypes, men have been viewed as less caring individuals) (Stott 2007; Anthony 2004). Undergraduate male nursing students' experiences of learning science have not previously been adequately investigated. The current study reduces this knowledge gap by investigating the experiences and changing perceptions of male students over the duration of the BN.

An analysis of significant numbers of students from diverse backgrounds during a period of rapid change may yield specific information relating to nursing students' academic perceptions, expectations, preferences and experiences, particularly in the context of learning science. Such a study is warranted to increase knowledge and understanding of the current nursing student populations, to address their concerns and meet learning needs in order to enhance nursing education, and reduce attrition, at this critical time of increased change and increased demand for skilled graduates.

1.2 Project aims

This study was designed to investigate student perceptions, expectations and experiences of learning science at the start of the BN program and while progressing through the three years of the nursing degree. The aims of this study were to:

- investigate the composition of tertiary undergraduate nursing student cohorts in the early 21st Century;
- develop awareness of the 21st Century nursing students' academic expectations, perceptions and experiences of learning science;
- examine undergraduate BN students' study behaviours and investigate whether they change over the duration of the course;
- identify the problems and challenges that large cohorts of undergraduate nursing students face as a consequence of the rapid unplanned changes due to the sudden expansion in the BN course;
- identify the effects of factors such as gender, age, and ethnic background on learning strategies and trends in students' expectations, perceptions and experiences of the BN and, in particular, of learning science;
- analyse how/or if students' perceptions and values, particularly of the science content, change or evolve over the duration of the BN course.

1.3 Significance of the research

This study is important in that it is a unique investigation into the effects of rapid change and expansion of numbers on nursing students' experiences of learning science at a major metropolitan university during the period 2005 to 2009. A primary focus was on developing a better understanding of this unique nursing

student population. The study enabled the analysis of a range of factors affecting the changing learning environment and explored how diversity impacted on students' learning. The study promoted better understanding of demographic subsets that were struggling in the tertiary environment and/or with learning science. Awareness of the effects of increased cohort size, increased diversity, and increased educational technology on students' learning of nursing science may culminate in adaptations to better meet students' expectations and needs, promote student engagement in the study of science, and enhance their learning experience. This would be a significant step towards minimising attrition of students in current times of recruitment difficulty and critical nurse shortages.

1.4 Overview of the thesis

This study evaluates nursing students' academic perceptions, expectations and experiences of science at different stages in the BN course during a period of a rapid change, both in student numbers and in the availability and use of educational technology. Students' learning preferences and study behaviours in the science units were investigated. The content of this thesis is structured as follows:

Chapter 1 Introduction: A brief background to the study is presented, the aims of the project are outlined, and the significance of the research is noted.

This chapter introduces the context for the study, outlining the shortage of nurses in Australia and worldwide. The challenges to learning and teaching, particularly of science, owing to internationalisation and diversification of cohorts, and student attrition from nursing courses will be discussed.

Chapter 2 Literature Review: To set the context of the research, a literature review is presented, which include current knowledge relating to the global shortage of nurses, student population diversity, gender, relevance and perceived difficulty of science, attrition from nursing courses, learning preferences and approaches.

The first part focuses on issues relating to nurse education in Australia, particularly the changing priorities and learning needs of diverse populations of nursing students. In particular, existing knowledge of students' early perceptions of nursing study and of technology, and the needs and concerns of mature-aged, international, and male students are identified. Findings from literature pertaining to students' learning preferences and approaches, and difficulties encountered in the study of science are highlighted. The literature review has identified a research gap, requiring a study into nursing students' academic perceptions and experiences of learning science.

Chapter 3 Methodology: A detailed description of the research methodology and development of the research instruments is presented. Ethical considerations, nature of the data, reliability, validity, data analysis and statistical analytic methods are described.

The details of research design and the rationale for choosing a mixed methods methodology will be presented. Integration of quantitative and qualitative research approaches, data collection, statistical analysis of numerical data and descriptive/thematic analysis of qualitative data will be discussed.

Chapter 4 Discussion of Results - Nursing Students' Demographic Information (2005-2009): Demographic factors (such as gender and age) of nursing students will be studied, including their family and work commitments, and reasons for choosing nursing. Demographic factors are analysed to elucidate the composition and characteristics of the heterogeneous body of nursing students. Nursing students' career choices and aspirations are described. The academic environment and nursing students' commitments to study of science units and paid work are discussed.

Chapter 5 Discussion of Results - Nursing Students' Perceptions of Study, and Learning Experiences in the Science Units: Information is presented about students' changing perceptions, preferences, and experiences of nursing education, with an emphasis on the science content. Analyses of nursing students' perceptions of, and preferences for, learning science are carried out with

respect to differences in gender, age and linguistic backgrounds. A study of students repeating a science unit is included, and their reasons for experiencing difficulties are examined. Issues of social justice affecting male students are also addressed.

Chapter 6 General Discussion and Conclusions: The major findings of this investigation are discussed, conclusions drawn, and areas for further research are identified.

Limitations of the study, and recommendations for policy and practice, and for future directions will be indicated.

Chapter 2

Literature Review

Chapter 2: Literature Review

2.1 Introduction

An extensive literature review was performed in order to identify, assess, synthesise and interpret existing research findings about undergraduate nursing students in a balanced way. This review of the available literature relating to tertiary nurse education defined existing knowledge, led to the identification of research gaps, and informed the perspective, justification and methodology for this thesis. Several search engines were utilised for the literature search: EBSCO host, CINAHL, MEDLINE, AMED, Academic Search Complete, Health Source - Nursing/Academic Edition, Humanities and Social Sciences Collection, Nursing Resource Centre, Health and Medical Complete, and Journals@Ovid. Systematic reviews, peer-reviewed journal articles, and articles from Government websites were retrieved as they were considered to be unbiased and reliable. Literature on research design and methodology was searched and categorised. Full systematic reviews, peer-reviewed journals, and e-books were retrieved from online literature search engines by typing keywords such as "first year experience", "nursing science", "attrition from nursing courses", and "male nursing students". Books on research methodology were accessed from the university library by searching the university catalogue. The bibliography was managed using EndNote X3 (and subsequently X4).

The reviewed literature was organised into several broad themes: shortage of nurses, nurse education in Australia, changing student demography and student diversity in higher education, first year experience, students' perceptions of tertiary study and of technology, changes in the educational environment due to advances in technology, and attrition from nursing courses.

The extensive literature search yielded information on current practices to address the global shortage of nurses, the changing tertiary education environment, student population diversity, gender role stereotyping in nursing, the relevance and perceived difficulty of science in nursing courses, and students' learning preferences and approaches in a range of situations. Evaluation of the information

from the literature search established the existing knowledge base. The present project aims to further knowledge about diverse sub-populations of nursing students learning science in the unique, dynamic academic environment in the early 21st Century.

2.2 World-wide shortage of nurses

Nurses comprise 40% - 50% of the global healthcare workforce (Productivity Commission 2006; WHO 2006). However, health services are reporting a serious shortage of nurses, nationally and internationally (Drury et al. 2009; Price 2009; Kelly & Ahern 2008; WHO 2006; Orlovsky 2005), which inevitably impacts on the health of populations (Gaynor et al. 2008). To compound this problem, the demand for healthcare by the ageing population in many countries is increasing (UN Report 2005, Bosco et al. 2001). The reasons for the global endemic shortage of nurses include insufficient numbers of people (particularly school-leavers) entering nursing (Drury et al. 2009; Price 2009), the ageing nursing workforce challenged by the high physical and psychological demands of the healthcare environment (Boland 2010; Erickson & Grove 2007; Orlovsky 2005; Magnussen & Amundson 2003), and the departure of high numbers of registered nurses (RNs) from the profession to pursue different careers (Kelly & Ahern 2008). Other factors driving the shortage of registered nurses include the increasing complexity of healthcare delivery models that requires nurses in both acute care and community settings to be more skilled and better informed (Boland 2010). Although enrolments in nursing programs are increasing, they are not sufficient to meet projected needs, considering the higher number of nurses who will soon reach retirement age (Preston 2006; AACN 2005).

2.3 Shortage of nurses in Australia

In all states and territories of Australia, a significant shortage of practicing Registered Nurses (RNs) has recently been identified (Boelen & Kenny 2009; Kilpatrick et al. 2007; Byrne 2005; Nugent et al. 2004) in addition to an ageing health workforce (Preston 2006; AIHW 2003). The proportion of nurses aged 50 years or over increased from 24% in 2001 to 35% in 2005 (AIHW 2006). Occupations with the largest increases in the proportion of workers aged 50 years and over were nurse managers, aged/disabled carers and personal care

assistants (ABS 2005). In order to address the shortage of nurses, various strategies were implemented by the Australian Government in collaboration with tertiary institutions. These included funding of additional places and resources for undergraduate nursing students, and modifying entry standards to increase intake into preregistration nursing courses (Drury et al. 2009; Nugent et al. 2004). In addition, financial incentives were offered for qualified nurses (who were either unemployed or working in non-health related jobs) to return to nursing practice, and immigration of foreign nurses to Australia was encouraged (Kline 2003). In November 2008, *ie.* during the current study, the Council of Australian Governments (COAG) announced a $64.4 billion deal over four years, the single largest investment in the health workforce ever made by an Australian Government. Of this funding, $1.6 billion was allocated for educating more nurses and other health professionals, and $28 million to be spent on training clinical supervisors, including 18 thousand nurses, to support students in training. The COAG announcement in November 2008 was estimated to lead to enrolments of an extra 10,800 nursing students by 2013 (Dragon 2009). In September 2008, the Rudd Labor Government announced an extra 1,094 Commonwealth funded higher education places in nursing programs from 2009. Tertiary institutes offering nursing education placed emphasis on measures to enhance learning and teaching (James et al. 2011; Mehta & Robinson 2010; Thalluri et al. 2005), and reduce student attrition from nursing courses (Stott 2007, 2006; Wilson 2005). For instance, some universities have introduced a bridging course in science for first year students (Boelen & Kenny 2009), a one-week "welcoming program" to mature-aged students (Fleming & McKee 2005) and "first year experience" programs (Krause et al. 2005) to enhance student transition to university. In addition there are initiatives such as academic writing workshops and other student support services on many university campuses. Retention of students in nursing courses and of nurses in the healthcare workforce is a national priority as an annual demand of 3-4% of nurse graduates by 2020 is forecasted (Preston 2006). Even greater annual increases in graduate numbers will be required if staffing levels are to be increased to best practice levels (Preston 2006).

As a result of the Australian Government initiatives and support to institutions offering nursing programs, enrolments in nursing degree courses have been

increasing significantly during the last decade. This has been evident in the Bachelor of Nursing (BN) course at the Australian Catholic University (ACU) in NSW. Since 2004, there has been a rapid expansion of the BN program at the ACU (NSW), from cohorts of less than 200 to cohorts of between 500 and 600 students.

2.4 Nurse education in Australia

2.4.1 Evolution of nurse education in Australia

Nurse education has transformed substantially in Australia and elsewhere in recent decades (Kevern et al. 1999). A hospital-based apprenticeship system operated until early 1970s, after which the education of nurses in tertiary institutions began in 1974 (Kelly & Ahern 2008; Friedel & Treagust 2005; Caon & Treagust 1993). The traditional role of the nurse has changed largely due to the increase in complex technology in the clinical setting and the development of nursing science (Friedel & Treagust 2005; Manninen 1998). Nurse education is not static but has to change to accommodate global trends in nursing philosophy and practice, including the depth of science knowledge required and the way it is taught (Friedel & Treagust 2005; King 2004).

2.4.2 Changing student populations in nursing education

2.4.2.1 Heterogeneity of nursing student populations

Until the late 1980s, typical student populations in the "traditional" tertiary classroom consisted mostly of single, residential (on campus) 18-23 year old students (O'Malley & McGraw 1999). Over the last three decades, the nursing student population has changed significantly to include increasing numbers of "non-traditional" (mature-aged, married, employed and non-residential) students (Rudel 2006; Schuetze & Slowey 2002; O'Malley & McGraw 1999). Student motivation factors are changing in that many students who would not previously have considered a university education are being driven to obtain a tertiary qualification to ensure a stable income and job security (Biggs & Tang 2007; Ramsden 2003).

In Australia, Government-supported strategies to reduce the shortage of nurses have included actively increasing enrolments into nursing courses (Kilpatrick et al.

2007; Salamonson & Andrew 2006; Fleming & McKee 2005; Nugent et al. 2004). This has resulted in diversification of the student populations (Asmar 2005; McInnis 2003). The student body has become increasingly diverse in terms of cultural, linguistic, educational and occupational backgrounds. Mature-aged and international students comprise a large proportion of nursing cohorts in Australian universities (James et al. 2011; Robinson et al. 2010; Drury et al. 2009; Mehta et al. 2008; Thalluri et al. 2005). Diversification is occurring at the same time as rapid social and behavioural change among undergraduate students in Australian universities (Drury et al. 2009; Asmar 2005; McInnis 2003).

2.4.2.2 Students' changing priorities and learning needs

In response to the unique and dynamic higher education environment of the 21st Century, nursing students' pattern of attendance at university has changed (Salamonson & Andrew 2006; Krause et al. 2005; McInnis et al. 2000). With more mature-aged students enrolling in and pursuing nursing studies, there has been a shift to tertiary students spending many hours in paid work (Krause et al. 2005; McInnis et al. 2000). As tertiary students find themselves having to maintain an income, they spend less time on campus and put in less effort, yet expect to achieve higher grades (Salamonson & Andrew 2006; Krause et al. 2005; Kuh 1999). In Australian universities during the period 1994 to 1999, the proportion of students working between 11 and 20 hours per week increased from 32% to 42% (McInnis et al. 2000). This concurs with the findings of a United Kingdom study (Lee et al. 1999) that 47% of nursing students had participated in paid employment during their course spending an average of 13 hours per week in part-time work. Salamonson and Andrew (2006) promulgated that participating in part-time employment had the potential to reduce students' time for study and hinder academic performance. However, the dilemma is that many nursing students may gain valuable experience and skills in health-related employment.

As access to nurse education has become flexible in an effort to increase admissions, more students with little previous experience in biology have been admitted into undergraduate nursing courses (McKee 2002). A significant correlation was identified between nursing students' previous level of biological qualification and confidence in passing biology assessments, with little or no

previous science education corresponding to low confidence in passing the subject (Gresty & Cotton 2003).

Despite the Australian Government initiative to fund additional places in university nursing courses, there have been few studies investigating the changing learning needs of the expanding and diverse population of nursing students and whether such needs are currently met. Much of the change has been basically a "knee-jerk" reaction to the shortage of nurses, rather than being carefully planned and controlled change. All research into this healthcare "emergency" increase in nursing numbers has, of necessity, to be retrospective.

In heterogeneous nursing cohorts, several sub-groups often exist, each with very different experiences of tertiary education which are dependent on factors such as gender, ethnicity, social class, marital status and the presence of school-aged children in the home (Montgomery et al. 2009; Steele & Lauder 2005). Families with one working parent and another who decides to re-renter education may face the prospect of having to re-negotiate their gender-based roles, which can lead to role overload and role interference for the students and their families (Steele et al. 2005; Shakya & Horsfall 2000). Students with young dependents may suffer stress in combining tertiary study, work, family and other responsibilities, particularly if they are single parents (Steele et al. 2005; Kevern & Webb 2004). Working class students, of which there are many, often have financial difficulties which may impact negatively on academic performance (Watson et al. 2008; McMillan 2007).

First generation tertiary students (who come from families in which no other members were tertiary educated) may take longer to adapt to university studies and may have lower academic performance compared to second generation students who are more likely to have home support, completed secondary education, and have developed effective study skills (Torner 2010). Therefore, second generation tertiary students initially usually perform better than do first generation students (Thalluri et al. 2005). Academic performance has been correlated with age as older students frequently performed better than younger students, whereas employment was negatively associated with academic

performance as working more than 16 hours per week was observed to be detrimental to study (Salamonson & Andrew 2006).

2.4.2.3 Mature-aged nursing students

Mature-aged students, world-wide, account for more than half of all students enrolled in baccalaureate nursing programs (Boelen & Kenny 2009; Drury et al. 2009b; ABS 2008). Over the past 25 years, in several countries, an increasing demand for skilled workforce and the endemic shortage of nurses has attracted more mature-aged students, including those from diverse ethnic and cultural groups, to all academic disciplines, including nursing (Fleming & McKee 2005). Boelen and Kenny (2009) and Drury et al. (2009a) have postulated that graduating a high percentage of mature-aged nursing students is making a significant contribution to nursing, helping to alleviate the current nursing shortage, but the risk of exacerbating the shortage projected to occur around the year 2020 remains. Mature-aged people return to formal study in order to change career, seek job opportunities and increase job security. However, mature-aged graduates enter an already ageing workforce and have a shorter working career than school-leavers (Drury et al. 2009).

In many societies, marital or de facto status is closely associated with age. Many mature-aged students are likely to have partners and, therefore may have other commitments (including children or dependents) that impinge on their learning time. While these students may have time constraints, they bring a wealth of life experiences such as caring, commitment and organisational skills (Thalluri et al. 2005), a range of preferred learning styles and study habits (Zeegers 2004) and possibly stability (emotional, financial, intellectual *etc.*) to the learning environment. In many instances, mature-aged nursing students tend to be more motivated to succeed and usually perform better at an academic level than do school-leavers (Montgomery et al. 2009; Thalluri et al. 2005; Zeegers 2004). However, in a study of first year biology unit conducted by Burke da Silva (2008), this trend was found to be reversed with a higher proportion of mature-aged students failing the unit compared to school-leavers.

2.4.2.4 International nursing students in Australia

Globalisation is having an enormous impact on tertiary education in Australia (Asmar 2005). In 2004, 11 of the 16 professions on the Australian National Skill Shortage List were in health (DEWR 2004). Shortages, or recruitment difficulties, of general and specialist registered nurses in all states and territories of Australia resulted in more students from diverse ethnic and cultural groups who were residents of Australia, as well as international students, enrolling in Australian nursing courses (ACU 2008; ABS 2007; Salamonson & Andrew 2006; DEWR 2005; McInnis 2003). The proportion of international students studying nursing in Australian Higher Education institutions increased from 9.6% in 1997 to 25.5% in 2006 (DEEWR 2008) with international students having even greater representation in areas such as nursing. In 2005, there were 164,000 international students studying at Australian higher education institutes – of these, 66,000 students were enrolled in the Vocational and Technical Education sector, which includes courses in nursing and other health sciences, "business administration and management", and "computer science and information systems" (ABS 2007).

According to an Australian Government Report (ABS 2007), education services provided in Australia to international students were valued at over $9 billion in export earnings in the financial year 2004-05. Popular disciplines include vocational courses such as nursing and business (Drury et al. 2009; ABS 2007). Full-fee paying overseas students are an important revenue source for Australian universities (DEST 2005). Education services represent the third highest export for Australia, and generated more income than from other commodities: beef $4.5 billion; wheat $3.2 billion; wool $2.3 billion (ABS 2007). International students spent almost $3.8 billion on fees (up from $1.8 billion in 2000), with 67% of this spent in the higher education sector.

International students obtaining an Australian qualification have the added incentive of being eligible to apply for permanent residency in Australia, providing they meet the selection criteria under the General Skilled Migration Program (DIAC 2011). In 2004, 34% of the 42,300 overseas students were granted an Australian Resident Visa (ABS 2007). Nurses have continued to be in high demand as part of the healthcare workforce throughout the period of this study

(2005-2009), and are currently in high demand in Australia with opportunities for permanent and temporary work available (DIAC 2011).

Australian academics are teaching higher numbers of international nursing students than ever before (Salamonson & Andrew 2006; Watson et al. 2005). The resulting diversification of the student population may present a challenge to university academics endeavouring to cater to the diverse and changing needs of students. It is imperative that nursing students' needs are identified and addressed in order to maintain high academic standards and to continue to attract overseas students to nursing courses in Australian universities. This present investigation was conducted when international tertiary nursing admissions were at their peak.

Between 50% and 55% of students enrolled in courses offered at ACU (NSW) during 2006 and 2007 were international students (Wright & Gollan 2008). Furthermore, there was an expansion of the number of home countries from which international students originated: in 2004, overseas students came from 48 home countries, and in 2007, students came from 62 home countries. Nursing cohorts at ACU (NSW) in the time period 2005-2009 comprised international students who came to study nursing (BN) from around the world, with highest representation from countries such as China, South Korea, Nepal, Japan and Philippines, and small numbers from India, Africa and European countries. This is in contrast to higher numbers of international students coming from countries such as Bangladesh, France and Indonesia to study business (BCom) at ACU (NSW) (Data from University Statistics). Hence, internationalisation of tertiary education is particularly evident at ACU (NSW), which has become very multicultural.

In Australia, multilingual nurses play a significant role in providing culturally congruent care to clients from diverse ethnic backgrounds (Shakya & Horsfall 2000). For admission to the BN course at ACU (NSW) over the period 2005-2009, international applicants required the equivalent of Australian High School completion and an academic IELTS (International English Language Testing System) score of a minimum of 6.0 in all tests (The IELTS score ranges from 1 to 9). For students who do not meet the English requirements, ACU offers many

flexible entry pathways for international students under the Diploma Pathways Programs, which are designed to meet the English and academic needs for such students. However, many students entering nursing with minimum competency in the English language struggle in tertiary studies and have lower academic success compared to those fluent in English language (Salamonson et al. 2010; Guhde 2003). Although academic writing can be a challenge for all nursing students (Gimenez 2008), it is particularly problematic for those who speak English as a second language (ESL). The attainment of an adequate level of academic writing by ESL students has been even more difficult in the biological sciences, where lower levels of English language proficiency makes it difficult for students to understand (Omeri et al. 2003) and process complex concepts (Salamonson et al. 2008). This is of concern as up to 55% of commencing nursing students in the study under discussion were international students from culturally and linguistically diverse (CALD) backgrounds.

Owing to differences in language and social skills, and in cultural backgrounds, some international students may demonstrate lower levels of social integration as they may not feel part of a group committed to learning (Stott 2007; Kelly et al.1996), while others may be more focused and goal oriented (Thalluri et al. 2005; Cross 1998). Some overseas students may be concerned about the financial commitments their families may have made on their behalf (Krause et al. 2005).

2.4.2.5 Generational diversity in nursing cohorts

In current times, students from three generational groups are likely to be present in any given nursing cohort, learning together in a university class-room (Gibson 2009). These generational groups are: Baby boomers (born between years 1945 and 1960), Generation X (1960-1980), and Net generation (also referred to as Millennial or Generation Y, 1980-2000) (Gibson 2009; Weston 2006). It is noteworthy that the actual cut-off dates for the various generations vary according to different sources (Treuren & Anderson 2010). The generational groups are presumed to share birth years, history, and a collective personality as a result of their defining experiences (Kramer 2010). In educating the youth, a quality outcome is dependent on our understanding of them (McCrindle 2008). In certain

contexts the generation gaps are today very evident, although it is essentially a communication gap as the new generations have grown up in a fast-moving, ever-changing society (McCrindle 2006).

Generation X students are comfortable with multi-tasking, and are likely to adopt a proactive approach to career development through tertiary studies and work experiences (Gibson 2009). Generation Xers were the first group to be introduced to computers and are comfortable with technology, which underwent major advances during their formative years and has become an important part of their lives (Kramer 2010). In the 1990s, many Generation Xers were not attracted to the nursing profession because of their perception that there were no growth opportunities available in nursing compared to other occupations (Sherman 2006). Subsequently some Generation Xers have now entered nursing as a second career (Kramer 2010), after realising that the nursing profession offers many work opportunities in specialist areas in addition to job flexibility and security.

Multiculturism, technology and instant communication (mobile phones, text messaging, and Internet) have always been part of the lives of the Net Generation students (also referred to as Generation Y, 1980-2000) (Gibson 2009; Weston 2006). Net generation students have been described as sociable, confident, open-minded, well-educated, and achievement-oriented (Raines 2003). The Net generation learns best by doing, collaborating, case studies, and simulations; and expect more coaching and mentoring than other groups (Kramer 2010).

2.4.2.6 The gendered culture of nursing

In the Australian Society that promotes multiculturism and upholds egalitarian values, an Australian Government publication (AIHW 2009) reported nursing as a female dominated profession, with females comprising 90.4% of employed nurses in 2007 (down from 91.4% in 2003). Recently, however, there has been a small but steady increase in male enrolments in nursing courses at Australian universities (Stott 2007, 2004). This increase can be attributed to recruitment strategies aimed at attracting males to consider nursing as a career and the positive media portrayal of males in nursing (Stott 2007; Wilson 2005).

Nursing is stereotypically viewed as a caring profession (Muldoon & Reilly 2003; Hemsley-Brown & Foskett 1999; Manninen 1998) and, as such, has continued to attract many women to the field (Harding 2009; Price 2009; Evans 2004; Holroyd et al. 2002). Grady et al. (2008) warned that men entering nursing programs might encounter role stereotyping and gender bias. The nursing profession is stereotyped as having the traditionally feminine traits of nurturing, caring and support (Brown 2009; Price 2009; Romem & Anson 2005; Evans 2004; Holroyd et al. 2002). This contrasts with the perceived male traits of strength, dominance and aggression (Brown 2009, Price 2009; Harding 2008; Evans 2004). Grady et al. (2008) reported that male nursing students may feel the need to work harder at caring, whereas female students tend to view it as something innate. Against this backdrop, it has been difficult for many men to enter nursing.

Florence Nightingale gained worldwide renown for her work as a nurse during the Crimean War (1853-1856) (BBC News 2006a). She laid the foundation of professional nursing with the establishment, in 1860, of her nursing school at St Thomas' Hospital in London (Bostridge 2008). To her, every woman was a nurse, and women who entered nurse training were doing only what came naturally to them as women (Nightingale 1860, re-published in 1969). Since this time, women have become dominant nursing personnel (Romem & Anson 2006). The Royal College of Nursing in the UK was reluctant to accept male applicants until 1960, despite the Government's effort to recruit men to overcome the shortage in nurses after World War II (Mackintosh 1997). However, a small number of male nurses continued to practice nursing from the end of the 19th century through to the middle of the 20th Century even though they were subject to considerable constraints. Since World War II, the nursing student population and workforce have largely (exceeding 80%) consisted of females (Kilpatrick et al. 2007). In Australia, nursing is dominated by women: in 2007, females comprised 90% of the 305,834 nurses in employment and males comprised the remaining 10% (30,583) (AIHW 2009). Between 2003 and 2007, there was a 12% increase in the total number of registered and enrolled nurses (AIHW 2009).

Gender balance is being achieved in various professions with numbers of females in traditionally male dominated professions such as medicine, law and engineering

increasing considerably (Dyck et al. 2009; Kermode 2006). Despite gender balance being achieved in other health professions, men are still a minority in nursing. The nursing profession is experiencing a gradual but steady influx of men (both local and international) in many countries, including Australia (Dyck et al. 2009; Stott 2007, 2004; Romem & Anson 2005; Yang et al. 2004). Despite the number of males who choose to enroll in nursing courses, male attrition rates are high (Stott 2007, 2004; Wilson 2005).

There is a paradox between widespread calls for men to participate more in caring and discourses which stereotype male nurses as homosexual and conflate homosexuality and sexual predation (Harding 2007). Harding (2008) further states that although a majority of male nurses may be heterosexual, the stereotype persists and has the potential to create homophobia in the learning environment and in the workplace, and deter men's entry into the profession. In a report entitled "Where are all the male nurses?" (Anonymous 2001), it is stated "The main reason men were not entering nursing was not because of poor pay, shift work or a lack of career advancement but because they fear being branded as effeminate or homosexual by their peers and families" (Anonymous 2001, p. 35). A number of researchers maintain that this may still be a significant factor that deters men from the profession (Armstrong 2002; Isaacs & Poole 1996).

Retention of males, particularly mature males, in nursing courses is problematic as the male attrition rate (see page 25) is higher than that of females (Andrew et al. 2008; Stott 2007; Wilson 2005). The experiences of male nursing students are poorly understood (Dyck et al. 2009; Stott 2004), which is why the present study, although broad in its scope, has a special focus on the perceptions, expectations and learning experiences of male students. Factors reported as "hindering" male nursing students' continuation included low self-confidence and being fearful and apprehensive concerning their ability to complete the degree because many had been away from study for a considerable amount of time (Wilson 2005). In addition, some male students are also faced with problems integrating into a predominantly female cohort (Harding 2008). Little is known about issues relating to the specific experiences of male students in nursing cohorts in the rapidly changing, technology-enabled learning environment of the early 21st Century.

2.4.3 Commencing nursing students' perceptions, experiences and concerns

2.4.3.1 Students' early perceptions of nursing study and of technology

Sand-Jecklin and Schaffer (2006) reported that beginning nursing students had a range of pre-existing perceptions about nursing study at university, including having strong images of the profession and specific expectations of their educational experiences. Many commenced pre-registration education valuing the profession and with positive perceptions of practice such as treating illness and promoting health through patient education (Fisher et al. 2002; Manninen 1998). However, many students underestimated the amount of effort required to progress successfully through the course and expected that a professional and financially bright future was within easy reach (Sand-Jecklin & Schaffer 2006). Compared to Australian students in the last two decades of the 20th Century, the 21st Century first year student is more likely to consider herself/himself a 'client' being served by the university (Krause et al. 2005; Bosco et al. 2001). The student desires a portable degree with flexible modes of delivery, and expects the university to be fully resourced (in terms of technology and support services) such that the qualification would be within easy reach and will present multiple career pathways or opportunities (Krause 2006).

Academic performance may be influenced by self-esteem. For instance, some mature-aged students may question their ability to learn at a tertiary level, fear embarrassment and failure, and this anxiety and fear impacts on their self-esteem (Boelen & Kenny 2009; Fleming & McKee 2005; Steele et al. 2005). A relationship exists between self-esteem and educational success (Boelen & Kenny 2009), where high self-esteem correlates with better academic performance (Begley & White 2003) and negative self-esteem correlates with chronic stress and avoidance behaviour (Lo 2002). No detailed studies linking gender and the academic performance of nursing students were identified.

Technology has made education more accessible (Gabbert & Sims 2007) but not easier, especially in the case of learning science (Keasar et al. 2005). Keasar et al. (2005) evaluated web enhanced instruction in college level biology courses, and concluded that e-learning did not make a dramatic improvement to students' academic performance. The rapid growth of scientific and technological

knowledge has brought about enormous changes for nursing and healthcare over the past hundred years (Barnard 2006). In addition, over the past two decades, the emergence of new electronic technologies has changed knowledge delivery modes to include online (education access through the Internet) and distance education (interactive learning) (O'Malley & McGraw 1999). The new educational technologies are often implemented without full understanding of their impact (O'Malley & McGraw 1999) or before adequate training and support services are made available to students (Tinto 2008). Universities seem to have raced to embrace educational technology without any significant awareness of student proficiency or preferences (Robinson et al. 2010). High levels of information and communications technology (ICT) usage do not necessarily translate into preferences for increased use of technology in the classroom (Caruso & Kvavik 2005). Mature-aged students represent a large group with much variation in the range of ICT skills (Dearnley et al. 2006). ICT skills are required in nurse education as students are expected to use computers to create documents and for general study. Students need to be able to use the internet to access a learning portal such as the Learning Management System (LMS) for self-directed learning (SDL), submitting assessments online, and attempting online quizzes.

According to Prensky (2001), the digital culture and environment (using computers, videogames, cell phones, digital music players, video cameras, *etc.*) in which students grow up change the way they think: "today's students think and process information fundamentally differently from their predecessors" (Prensky 2001, page 1). ICTs permeate all aspects of students' lives (Caruso & Kvavik 2005). The Internet has provided a new mechanism for connecting teachers and students (Glass & Sue 2008). Tertiary educational and curricular environments have become more independent and flexible through e-Learning. Technology has been instrumental, not only in making education readily accessible to student cohorts (with distant learning via online access to course modules) that are increasingly heterogeneous (Glass & Sue 2008; Cuthrell & Lyon 2007), but also in facilitation of student learning and socialisation (Krause et al. 2005; Eklund et al. 2003). For instance, students may form networks by interacting through various means such as using a learning management system (LMS), online discussion forums, and mobile telecommunication technologies (Farquharson 2007).

However, it has been reported that some students, including those from overseas, at Australian universities do not feel part of a group committed to learning nor experience a sense of belonging (Krause et al. 2005). Many authors have confirmed that student engagement has emerged as an important aspect of academic success (Kift 2010; Tinto 2008; Farquharson 2007, Krause et al. 2005; McInnis & James 2003). This is particularly relevant to nursing cohorts, as formation of learning communities has been a successful strategy developed to effectively learn complex subjects such as science (Noble & Henderson 2008; Wilson et al. 2006). Mentoring and academic guided peer support have been found to be beneficial for struggling nursing students, particularly in science units, as such strategies nurture personal, professional and intellectual growth and development through peer interaction, friendship and a sense of community (Robinson et al. 2010; Wilson et al. 2006).

Many of the commencing students may be competent in ICT skills but often lack the required fluency to be able to understand the complexities of learning science (Salamonson et al. 2010; Klisch 2000; Shakya & Horsfall 2000).

2.4.3.2 Science in the nursing curriculum

The clinically relevant science subjects providing the scientific underpinning for nursing practice are traditionally considered to be physiology, anatomy, pathophysiology, pharmacology and microbiology (Thalluri et al. 2005; King 2004; McKee 2002; Jordan & Reid 1997). Most nursing programs also include a fundamental coverage of chemistry and physics. Although science is an important component of the nursing program, it is this subject that has been cited by nurses as most frequently causing problems for BN students (Harvey & McMurray 1997; Nicoll et al. 1996; Caon & Treagust 1993). Compared to other areas of the curriculum, science was identified as a cause of disproportionate difficulty and anxiety amongst nursing students (Jordan et al. 1999).

Over the past 50 to 100 years, nursing practice has evolved largely due to developments in science and technology (Barnard 2006; Friedel & Treagust 2005; Prowse 2003a). Science education is a key component of nurse education as it empowers nurses to think critically in order to respond to and initiate change, and

practise safely and interprofessionally in the present demanding clinical environment (Smith & Coleman 2008; Amaro et al. 2006; Friedel & Treagust 2005). Science knowledge is crucial for the delivery of high quality care and also influences patient outcomes (Prowse 2003b). It is important that students adequately understand the science behind nursing practice. While there have been several previous static studies on the learning of science by first year nursing students (Gresty & Cotton 2003; McKee 2002; Jordan et al. 1999; Nicoll et al. 1996), extensive review of the literature has revealed no previous longitudinal studies carried out to evaluate nursing students' changing academic perceptions, expectations and learning experiences of the science component of the Bachelor of Nursing program.

Although beginning nursing students are generally aware of the importance of science to nursing practice, they often encounter difficulties in their study of science as the content is large and the terms are very technical (Strube et al. 2004; McKee 2002; Clancy et al. 2000). There are reports from the USA, UK and Australia of some nursing students and graduates not having an adequate level of knowledge in science disciplines, which have led to authors calling for increased teaching input in these disciplines (King 2004; Bullock & Manias 2002; Anema 1988, cited in Jordan & Reid 1997).

2.4.3.3 Difficulties encountered by students during the undergraduate nursing course

The first year of undergraduate enrolment is the time when students are most likely to encounter problems and experience stress (Watson et al. 2008; Dzurec et al. 2007; Deary et al. 2003; Lo 2002) as they struggle to adjust to university study both academically and socially (McInnis & James 2003). Heterogeneous sub-populations of students have special and diverse learning needs arising from the social and academic transition, and they must be engaged as learners if they are to have a successful university experience (Kift 2004). The better the first year experience, the more likely students are to successfully complete their studies (Kift et al. 2010; Stassen 2003). Universities are trying harder to retain students, especially since students are entering with lower credentials than before.

Several Australian studies on transition to university have shown that interventions targeting beginning students are proving beneficial in enhancing their first year experience and, thereby, improving student success and retention (Kift & Nelson 2005; Krause et al. 2005; Stassen 2003; McInnis 2002). A number of initiatives (bridging, transitional and enabling programs) that support first year students are described in the literature. Australian university educators have attempted to meet the challenges of student diversity by measures such as investing in appropriate resources (Tinto 2008), infrastructure (Radcliffe et al. 2008), improving welcoming/orientation programs (Fleming & McKee 2005; McInnis 2003), introducing compulsory bridging courses in science (Boelen & Kenny 2009), and other initiatives such as academic writing workshops (Robinson et al. 2010; Salamonson et al. 2009; Asmar 2005) to enhance students' first year experience. Such initiatives aim to build self-esteem, encourage social interaction, and develop support systems.

Kift and Nelson (2005) proposed a "transition pedagogy" that involves designing first year curriculum capable of delivering an integrated and holistic first year experience (FYE). Such curriculum design incorporates co-curricular activities (non-compulsory activities offered by institution/faculty/discipline to support and expand the learning opportunities of the formal curriculum e.g. peer mentoring) and extra-curricular activities (non-compulsory activities offered broadly across the institution which are not closely associated with the curriculum, e.g. clubs and societies). Kift & Nelson (2005) conceptualised the FYE as "everybody's business" and recommended implementation of transition pedagogy in the form of an intentionally designed curriculum by partnerships with academic and professional staff in a whole-of-institution transformation. Transition pedagogy provides the optimal vehicle for dealing with the increasingly diverse commencing student cohorts by facilitating a sense of engagement, support and belonging (Kift et al. 2010). Much of this research is retrospective, and the students in the early 2000s did not benefit from this knowledge.

Despite efforts by universities to enhance the FYE, some students from various backgrounds continue to: experience difficulties in adjusting to the workload demands of university study, feel inadequate with the level of academic

performance expected, and lack study skills and background knowledge (McInnis 2003). A study carried out by Zimitat (2003) found that mature-aged, Australian-born students generally had higher perceptions of inclusion in academic and campus interactions than Asian-born students. However, younger Australian-born students, often considered at high risk of discontinuing study, perceived the lowest levels of inclusion. Nursing students from a non-English speaking background (NESB) were at greater risk, than students from English backgrounds, of underachieving and failing the first year assessments than students from English-speaking backgrounds (ESB) (Zollo 1998).

Students' perceptions of and attitudes towards study, staff, and towards other students are presumed to be influenced by factors such as their age, gender, academic ability, personality, type of school attended, socio-economic status (Hemsley-Brown & Foskett 1999), language (Klisch 2000; Shakya & Horsfall 2000), educational and ethnic background (Asmar 2005). As student demography, attitudes, behaviours and perceptions are usually closely associated and interdependent, a research focus on nursing students' attitudes, behaviours, and perceptions may assist in clarification of how demographic factors relate to and/or influence student learning. Students from CALD backgrounds may experience problems learning in a second language, and may be afraid to form learning circles which would be mutually beneficial in solving their academic as well as other relevant student issues (Noble & Henderson 2008; Tinto 2008). The problem of social inequity may persist as long as students who are not confident in English remain inactive in class and hesitate to ask questions or express their academic or other problems associated with settling into a new environment (Farquharson 2007; Klisch 2000; Shakya & Horsfall 2000).

2.4.3.4 Attrition from nursing courses

Attrition of students from a course, also referred to as "wastage" or "dropout", is defined as withdrawal at any stage from a course without graduating (Andrew et al. 2008; Stott 2007). Over the past two decades worldwide, there has been much variation (7%-55%) in reported attrition rates from nursing courses (Gaynor et al. 2008; BBC News 2006; Pearce 2004). According to Andrew et al. (2008), the attrition rates in Australian undergraduate courses are far greater in the first year

than in subsequent years. Data obtained from the Nursing Standard magazine (BBC News 2006) reported a drop-out rate as high as 50% (Pearce 2004). An Australian study (Wilson 2005) at a regional university revealed that male enrolments over a three year period averaged 17% (n=217) and the average attrition for males over the same time period was 55.5%, compared to female attrition of 45%. Attrition from nursing courses is undesirable, given the critical nursing shortage in Australia and around the world, the ageing nursing workforce, the expense of tertiary education, and the difficulty in attracting and retaining young people (Drury 2009).

Attrition is often higher in nursing than in other courses due to the confronting nature of the work the students are required to do while on clinical placements. Female and male students who have withdrawn from nursing courses have also stated reasons such as family or work commitments, emotional or physical health (Pryjmachuk et al. 2009; Krause et al. 2005; Elliott 2002), or the difficulty in learning, particularly science (Pearce 2004; Harvey & McMurray 1997). Progression rates are slow as students fail and repeat subjects thereby extending the time to completion (Salamonson & Andrew 2006).

The attrition rates of male and female students (Stott 2007; Wilson 2005) do not provide a suitable indicator of the influence of gender in academic performance because the reasons for attrition are usually multifactorial, cannot be generalised, and not always related to academic ability (Cameron et al. 2010; Andrew et al. 2008; Pryjmachuk et al. 2008; Glossop 2002). Students may leave nursing courses even when they may be performing well academically (Cameron et al. 2010; Pryjmachuk et al. 2008). The stress of academic study is an issue for nursing students and stress of occupational duties for qualified nurses leading to psychological distress and attrition (Watson et al. 2008). Factors intrinsic to nursing practice include a highly demanding job with poor support, shortage of resources and staff, rapidly changing circumstances, dealing with death and dying, and the need to undertake continuing professional development (Chang et al. 2005). Chang et al. (2005) further report that these factors are compounded by environmental factors such as difficult patients and their families, and difficult working relations with other healthcare professionals. Such a complex interplay of

factors can cause emotional exhaustion in undergraduate students and nurses (Deary et al. 2003).

2.5 Students' learning preferences and approaches

Learning involves acquiring new knowledge, understanding, values, behaviours or skills (Tanner & Allen 2004). A learning style or preference is the complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn (James & Gardner 1995). Students can take different approaches to learning (surface, strategic, deep) depending, at least in part, on the teaching methods used (Mansouri et al. 2006; Entwistle & Peterson 2004; Entwistle 1997). The common sensory modes of learning include reading, writing, visual, auditory, and kinaesthetic (Fleming & McKee 2005; Fleming 1987). Some students are kinaesthetic learners as they prefer to use all their senses for learning (Wehrwein et al. 2007; Lujan & DiCarlo 2006).

It is imperative that either innovative methods are developed or proven methods are used to facilitate students' learning in the science units to avoid student attrition. There is a variety of learning styles present in a tertiary classroom, and some students may not be reached by the standard lecture format (Wehrwein et al. 2007). In the mid 1990s, there was less reliance on lectures and a move to problem-based learning (PBL) and inquiry based learning (IBL) at many tertiary institutions (Wells et al. 2009; Smith & Coleman 2008; Bebb & Pittam 2004). Tutorials and PBL sessions, teaching modes that promote active (or deep) learning, are formats ideal for teaching small groups (Wells et al. 2009). A PBL session is different from a tutorial in that it is an interactive, scenario-based teaching approach where a situation or "problem" is presented for discussion. PBL is considered effective because adults are motivated to learn when practical problems are identified (Matthews-Smith et al. 2001; Knowles 1990, cited in Davies et al. 2000). The concept of PBL as student-centered learning method has been most widely utilised by educators in the health professions as it has been shown to stimulate development of higher order intellectual skills and abilities as well as lifelong learning skills (Wells et al. 2009; Smith & Coleman 2008; Matthews-Smith et al. 2001). As nursing is a practice-based profession, practical

laboratory classes are also likely to be popular amongst nursing students, especially those who are kinaesthetic learners (James et al. 2011; Wehrwein et al. 2007; Lujan & DiCarlo 2006).

In tertiary education, students are sometimes exposed to an educational concept referred to as Self-directed learning (SDL). In this supplementary learning mode, students identify their own needs and decide on learning activities while the tutor takes the role of facilitator. However, many students entering nurse education were not used to taking such an active role in their education (Ghazi & Henshaw 1998) and found it least effective (Courtenay 1991). Only limited use of this educational strategy has been made in teaching science to nursing students at ACU (NSW).

Development of technologies has offered new pathways for educators to reach their learners. Emerging technologies such as lecture podcasts and learning management systems or virtual learning environments have provided innovative tools to support students and promote flexible learning (Tynan & Colbran 2006; McElroy & Blount 2006; Shannon 2006). Technology-supported learning environments have the potential to encourage students to actively engage in and shape their personal learning experiences (Hodges 2004). However, the introduction of technology into education has been largely speculative, with little evidence to guide new initiatives. Since the release of Microsoft PowerPoint in 1990, PowerPoint presentations have become very popular in higher education, and have been effectively used for visual learning when students were expected to retain complex graphics, animation, and figures (Van den Broek 2009).

2.6 Research gap

Despite the wide body of research into nursing students' "behaviours", little is known about the effects of rapid and widespread diversification on the undergraduate nursing students' learning experience. The world-wide shortage of nurses has occasioned an Australian Government initiative to increase enrolments in tertiary nursing courses. Increased intake of mature-aged and international students into nursing programs has made the undergraduate nursing cohort more heterogeneous in terms of demographic characteristics and educational ability. At

ACU (NSW), the concurrent changes in student numbers, student diversity and educational technology have impacted on nursing education, with potential ramifications as to how students perceive, experience and learn science, which is an important component of nurse education. There is a need to better understand the diverse body of nursing students of the 21st Century and their varied learning experiences and concerns in their study of science in nursing programs, in order to reduce student attrition from nursing courses at a time when there is an increased need for skilled graduates.

2.7 Chapter review

Nurse education has changed much in Australia and the world in recent decades. Enrolments in nursing degree courses have been increasing in recent years in response to the Australian Government initiatives and support to institutions offering nursing programs. Consequently student populations have become increasingly heterogeneous in terms of cultural, linguistic, educational and occupational backgrounds as they have changed from traditional female school-leavers to a non-traditional mix of students who are mostly mature-aged, international, and working females and increasing numbers of males. Many students, including those with little or no previous science education, and who do not realise the relevance of science to nursing practice, often experience difficulties in studying science.

Despite efforts by universities to enhance the FYE and to retain students in nursing, some students from various backgrounds continue to experience difficulties in adjusting to university life, the nursing course and the study of science. Non-completion rates in university nursing courses are high, and progression rates are slow as students fail and repeat subjects thereby extending the time to completion. Attrition from nursing courses is undesirable, given the critical nursing shortage in Australia and around the world, the ageing nursing workforce, the expense of tertiary education, and the difficulty in attracting and retaining young people. Student diversity is potentially problematic to nursing academics who have to cater to students' varied learning needs, enhance their learning experience, and minimise their attrition from the nursing course.

A variety of learning styles exist in the large nursing classrooms. Technology-supported learning environments use learning and teaching modes including lecture, practical, problem-based learning and tutorial classes. Active learning strategies and the formation of learning communities encourage students to develop problem-solving and critical thinking skills, and have been successful in nursing education.

The literature review raised awareness of the need to better understand the current cohorts of nursing students, particularly at the Australian Catholic University (NSW) where enrolments in the nursing program have rapidly increased. There were no other studies looking into how the increasingly diverse body of students behave or cope in the current tertiary learning environment. Despite increasing educational technology, not much is known about the extent of challenges faced by the students, and how they adapt to their study, particularly of science. In order to address the paucity of information about the diverse body of nursing students' perceptions, learning experiences and concerns in their study of science in the undergraduate nursing program at ACU (NSW), the aims of this study were to:

- investigate the composition of tertiary undergraduate nursing student cohorts in the early 21st Century;
- develop awareness of the 21st Century nursing students' academic expectations, perceptions and experiences of learning science;
- examine undergraduate BN students' study behaviours and investigate whether they change over the duration of the course;
- identify the problems and challenges that large cohorts of undergraduate nursing students face as a consequence of the rapid unplanned changes due to the sudden expansion in the BN course;
- identify the effects of factors such as gender, age, and ethnic background on learning strategies and trends in students' expectations, perceptions and experiences of the BN and, in particular, of learning science;
- analyse how/or if students' perceptions and values, particularly of the science content, change or evolve over the duration of the BN course.

The extensive literature review served to identify the research gap in nursing education and assisted in the development of this study's conceptual framework. The literature review indicated the need for a complex mixed methods study, which utilises different types of data. The literature review supported this study in synthesis of the findings.

Chapter 3

Methodology

Chapter 3: Methodology

3.1 Introduction

This chapter describes the research design of this project, development of research instruments, data collection, validity checks, data analyses, and statistical testing of quantitative data. A combined horizontal and longitudinal mixed methods approach was selected for this investigation of nursing students studying science units, in which quantitative and qualitative data were gathered using questionnaire surveys, focus group discussions and one-to-one interviews. Three successive cohorts were followed over the full three years of the Bachelor of Nursing (BN) course at Australian Catholic University (ACU) in NSW.

3.2 Research context and setting

ACU is a national university which has six campuses along the east coast of Australia. ACU is unique in that it has traditionally excelled in small group and vocational teaching, and has continued to attract a very diverse student community (including international students from all the continents). The NSW Campus is a small, urban campus located at North Sydney. It was chosen for this study because it is the ACU Campus that attracts the highest number (approximately 50%) of international students into its Bachelor of Nursing (BN) program, and also where the researcher works as a lecturer in nursing science. The timing of this investigation coincided with a large increase in undergraduate nursing student enrolment - a 69.5% increase at the NSW Campus in 2005 compared to the previous years.

Three successive cohorts of undergraduate nursing students at the NSW Campus (ACU) were studied. Students were invited to complete surveys and participate in interviews. The students in these three cohorts were diverse in terms of age, linguistic, cultural, educational, socio-economic and occupational backgrounds. The annual intake of first year students in the BN course during the study period (2005-2009) varied between 371 and 520 students, of whom 50.5% - 59.3% were international students and 40.7% - 49.5% were local students. Many "local" students were culturally and linguistically diverse (CALD). Since the Year 1

students who were enrolled in science units during 2005 to 2007 were invited to participate in the study in Semester 2, the target population of first year (Semester 2) cohorts was 348-379 students. The second semester cohort is usually smaller than the first semester as those students who decide to leave the course mainly do so during Semester 1 of the first year (Andrew et al. 2008). The potential target populations for the first, second and third year nursing science cohorts are presented in Table 3.1. The second year cohorts were larger than the first year cohorts because 50 to 75 externally qualified enrolled nurses (ENs) joined the BN program in the second year of the course after completing a bridging course at a College of Technical and Further Education. The second year cohorts also included students who were repeating the second year units and those who were studying part-time.

Table 3.1: Target populations

First year cohorts						
Year	2005	2005	2006	2006	2007	2007
Semester	Sem 1	Sem 2	Sem 1	Sem 2	Sem 1	Sem 2
Students (n)	410	379	371	348	375	365
Second year cohorts						
Year	2006	2006	2007	2007	2008	2008
Semester	Sem 1	Sem 2	Sem 1	Sem 2	Sem 1	Sem 2
Students (n)	419	402	484	460	492	440
Third year cohorts						
Year	2007	2007	2008	2008	2009	2009
Semester	Sem 1	Sem 2	Sem 1	Sem 2	Sem 1	Sem 2
Students (n)	395	378	406	396	426	410

(Note: first and second year students were surveyed mostly in Semester 2 in the relevant year of study, whereas third year students were surveyed in Semester 1 as they did not study a science unit in Semester 2.)

Ethics approval for the study was sought and granted by the ACU Human Research Ethics Committee (see Appendix A).

3.3 Research approaches

Both quantitative and qualitative data are widely used in educational research (Bhattacharyya & Bodner 2005). Quantitative research uses objective numerical

data to prove or disprove existing hypotheses, whereas qualitative research may commence from observations which, when categorised, may lead to a better understanding of the issues under investigation (Punch 2009; Polit et al. 2001).

3.3.1 Quantitative approach

Demographic and factual information is easily accessed by quantitative methodologies. In a quantitative approach, knowledge is developed through deductive, postpositivistic means such as measuring attitudes and rating behaviours. This type of approach employs strategies of inquiry such as surveys or experiments, and allows collection of data that can be analysed statistically (Punch 2009; Pearson 1997). Trends can be identified, correlations between variables can be examined (Bretz 2008). Quantitative data is collected based on precise measurement using structured and validated data-collection instruments. It is possible to study student behaviour under controlled conditions. Many quantitative researchers attempt to identify cause-and-effect relationships (usually of single variables) to enable them to make probabilistic predictions and generalisations (Johnson & Christensen 2011). However, Runciman (2002) points out that some constraints pertain to aspects of quantitative research. For instance, parameters are sterile, or strictly defined. Values must often be reduced to numbers using measurement techniques which may only capture one facet of a multi-faceted phenomenon (Runciman 2002).

3.3.2 Qualitative approach

Qualitative researchers collect data through in-depth interviews, participant observation, field notes, and open-ended questions to study behaviour naturalistically and holistically (Holloway & Wheeler 2010). The qualitative researcher uses descriptive data analysis to search for patterns, themes, and holistic features, with the aim of appreciating difference or variation (Johnson & Christensen 2011).

In qualitative research, words, narratives, or documents are analysed to form themes, relationships and concepts, or to develop theory (Creswell & Plano-Clark 2011). Qualitative research is particularly useful where problems are complex and contextual as in a tertiary academic setting (Basit 2010; Holloway & Wheeler

2010). Nursing student cohorts, in particular, are diverse in terms of age, ability, linguistic and cultural backgrounds and they are influenced by the interaction of physical, psychological and social factors during their preregistration education. Classification of qualitative research methods signal static boundaries (a fixed way of ordering the world of inquiry), and as such may be confusing (Sandelowski 2010, 2000). The value of qualitative description lies not only in the knowledge its use can produce, but also as a vehicle for presenting and treating research methods as living entities that resist simple classification (Sandelowski 2010). The three main qualitative research approaches (strategies of enquiry) are ethnography, grounded theory and phenomenology (Barbour 2007; Creswell 2003; Polit et al. 2001). Ethnography is used to describe and interpret how the behaviour of people is influenced by the culture they live in; cultural behavior of individuals or groups is usually studied over a sustained period of time. Grounded theory, or case study approach involves inductive reasoning through exploration of processes, activities and events (Creswell 2003; Polit et al. 2001). Phenomenology is a research method designed to reveal the essence and meaning of lived experiences of individuals or groups. Phenomena can be studied from many perspectives and in greater depth; findings are based on constructivist perspectives (multiple meanings of individual experiences), and these meanings are socially and historically constructed). The present study has some small overtones with phenomenology; aspects of phenomenology impacted on the qualitative research design as students' perceptions of learning science, and their attitudes and preferences were studied. Themes were developed (such as language difficulties, and problems encountered in learning science) by identifying common issues that influenced student life.

One major criticism of qualitative research is the difficulty of achieving valid and reliable results. Since it is often narrative and not numerical, it is not a simple task to ascertain trustworthiness and generalisability of qualitative data (Burns 1998).

Limitations of quantitative and qualitative approaches may be minimised, and the value of research data maximised, by mixed researchers who collect multiple kinds of data (mixtures of variables, words, categories, and images) to study

multiple contexts, perspectives, or conditions as they operate together (Johnson & Christensen 2011).

3.3.3 Mixed methods approach

When numeric and text information are collected and analysed in a single study, this is referred to as a mixed methods research design (Johnson & Christensen 2011; Basit 2010; Johnstone 2004). Mixed methods/methodologies research has great appeal when there are multiple facets of a research question that need exploring, and one method is insufficient to address all the issues at hand (Anaf & Sheppard 2007). In addition to a quantitative methodology, a qualitative design facilitates further unpacking of relevant information to provide deeper insight and clarification. The two approaches are complimentary.

The benefit of a mixed methods design is its usefulness in capturing the best of both quantitative and qualitative approaches; quantitative and qualitative data are combined to rigorously analyse all the data and enhance the overall findings (Creswell & Plano-Clark 2011). All research designs may have limitations and biases. A mixed methods approach tends to neutralise or cancel these biases. Other advantages of a mixed methods approach include: complementarity, whereby overlapping and different facets of a phenomenon may emerge; expansion, which broadens the scope of the study; and triangulation, whereby findings from multiple sources are reviewed and analysed, promoting convergence of that information (Holloway & Wheeler 2010; Creswell 2003).

Two main models of mixed methods research have emerged (Cresswell & Plano-Clark 2011): the 'merging of results' model and the 'reporting of results in a sequence' model. In a mixed methods approach, the researcher selects a design that reflects interaction, priority, timing, and mixing. The various design options (Convergent, Exploratory, Embedded, Transformative, and others) vary on these decision points. In a concurrent design, it is common to separately report quantitative and qualitative results, followed by merging the data in a subsequent discussion section (Cresswell & Plano-Clark 2011).

The three major research approaches can be viewed as falling on a research continuum with quantitative research and qualitative research as extremes on either sides, and mixed research in the centre of the continuum (Figure 3.1):

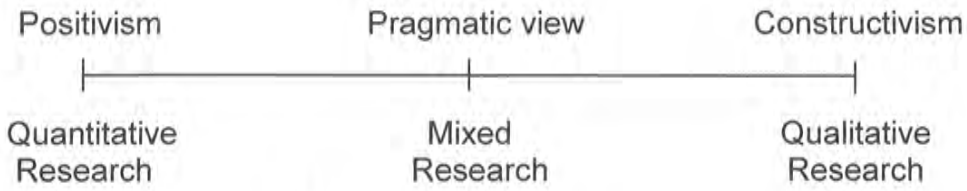


Figure 3.1: The research continuum

3.4 Study design

Research design provides specific directions for procedures within a research study (Punch 2009; Creswell 2003). The mixed methods research design adopted in this study is described as the explanatory sequential design (Cresswell & Plano-Clark 2011), as shown diagrammatically in Figure 3.2.

Figure 3.2: Mixed methods research – explanatory sequential design

Methods are implemented sequentially, starting with quantitative data collection and analysis in Phase 1 followed by qualitative data collection and analysis in Phase 2, which builds on Phase 1. The purpose of this design is the need to expand the quantitative data. The timing of the strands is sequential: quantitative first, then qualitative, and the primary point of interface for mixing is at the time of data collection; that is, collection and analysis of quantitative data guides the development of the second phase (qualitative) of study. The primary mixing strategy involves connecting the two strands: quantitative data analysis and qualitative data collection. Strength of the explanatory sequential design is that it lends itself to emergent approaches where the second phase can be designed based on what is learned from the initial phase (Cresswell & Plano-Clark 2011).

An advantage of using the mixed methods explanatory sequential design (conducting two methods in separate phases) was that it was possible for a single researcher to conduct this study. One challenge in using this design was deciding which quantitative results needed to be further interrogated. Significant results or trends in the survey data were considered as the second (qualitative) phase was planned for each cohort.

This combined horizontal three year study with a three year longitudinal investigation employed a triangulated methodology using research instruments capable of generating quantitative and qualitative data. A mixed methods approach was adopted in this study to qualitatively investigate the identified proportion of students encountering difficulties while learning science, their study behaviours, reasons why many students struggled in the science units, if their perceptions and learning experiences in the science units changed, and the strategies they used to overcome their difficulties in learning science. The rationale for using the concurrent design was to collect complementary data to expand understanding of nursing students' learning needs and concerns in the science units, and for the purpose of completeness. A qualitative descriptive research design was used to investigate student opinions and experiences, in order to gain broader insights. Qualitative descriptive study is the method of choice when describing phenomena; such studies offer a comprehensive summary of events in the everyday terms (i.e. students' own words rather than the researcher's words or interpretation) of those events (Sandelowski 2000). For instance, survey data simply indicated that many nursing students at ACU (NSW) experienced difficulties in their science units, while the qualitative study provided students opportunity to voice their needs and concerns. However, in the descriptive approach taken, sample numbers were small and participants were asked questions requiring descriptive answers.

In the sequential approach adopted, student discussions provided data to supplement quantitative survey data - this stimulated interrogation of contrasting datasets through comparison, which aided identification and explanation of discrepancies. In this investigation, the focus was on students' learning, in particular their expectations, perceptions and experiences of learning science.

This research adopted an interpretive perspective (Barbour 2007; Creswell 2003), as the researcher was intensively engaged in the research situation (taught nursing science units to the first, second and third year students during the course of this study and was involved in lectures, tutorials, problem-based learning (PBL) and practical classes).

Triangulation facilitates corroboration, convergence or confirmation of results generated using different methods or from various data sources (Barbour 2007; Johnstone 2004). The notion of triangulation (borrowed from navigation and surveying) relies on the idea of a fixed point of reference, allowing researcher(s) to identify the method that delivers the most "authentic" or reliable findings. Data triangulation produces a "thick description" of the phenomenon of interest that would not be possible if a single method was used. Triangulation methodology facilitates simultaneous analysis of the same issue, concept or situation from a variety of different angles, and enables development of a coherent justification for themes - it was for these reasons that triangulation methodology was considered essential for the pilot (Mehta et al. 2008) and the main study. A research design based on surveys, focus groups and interviews particularly suited the complexities pertaining to the large, diverse body of students with differing perceptions, expectations, experiences and concerns. For instance, the survey provided a quantitative overview of students' responses to a questionnaire item such as:

"*I have begun to appreciate the relevance of science to nursing*"

[Strongly agree / Agree / Disagree / Strongly disagree]

However, qualitative methods such as focus group discussions, one-to-one interviews, and direct observations in the learning environment were necessary to provide further valuable insight into the student related issues such as students' learning styles, study tactics, and their opinions and preferences for teaching modes and science subject/s.

At the commencement of this project, a pilot study was conducted using a questionnaire survey for data collection. Subsequently, for the main study, a survey was designed to gather mostly quantitative data and some qualitative data. Based on the pilot study, the present study has been developed such that it forms the middle ground pragmatic view, rather than aspects of positivism only (from the

quantitative end) or constructivism only (from the qualitative end) – see Figure 3.1. Rather than an equal emphasis on quantitative and qualitative approaches, this mixed methods study has an emphasis on quantitative study as it forms the explorative phase of the research. The findings are then supplemented by a qualitative confirmatory phase. This approach was considered suitable to study and quantify specific variables in the questionnaire survey and then shedding more light by a qualitative focus. An exclusively quantitative method or an exclusively qualitative method would not be sufficient in addressing and satisfying the research aims. Therefore, both quantitative and qualitative approaches, that is, using questionnaire surveys followed by focus groups and in-depth interviews were considered necessary.

The main findings pertaining to students' learning preferences and experiences of science were obtained by the quantitative phase for each cohort. Quantitative data was collected first with the intention that a qualitative focus would then provide further insight and clarification of student related issues such as reasons for choosing a nursing career, perceptions of science as a relevant component of nurse education, preferences for science subjects, teaching modes, and learning styles. The survey was followed by a purely qualitative approach (qualitative descriptive research) in the form of student focus group discussions and interviews. Complementary data collected by the qualitative phase expanded understanding of nursing students' learning needs and concerns in the science units. The qualitative phase assisted in fully identifying the nature of difficulties encountered in learning science.

Integration of the quantitative and qualitative data occurred at the time of analysis and interpretation of the findings. This research process, essentially a sequential strategy of inquiry, was adhered to throughout the study. A flow diagram shows how the study was conducted and how each phase fitted in - Figure 3.3.

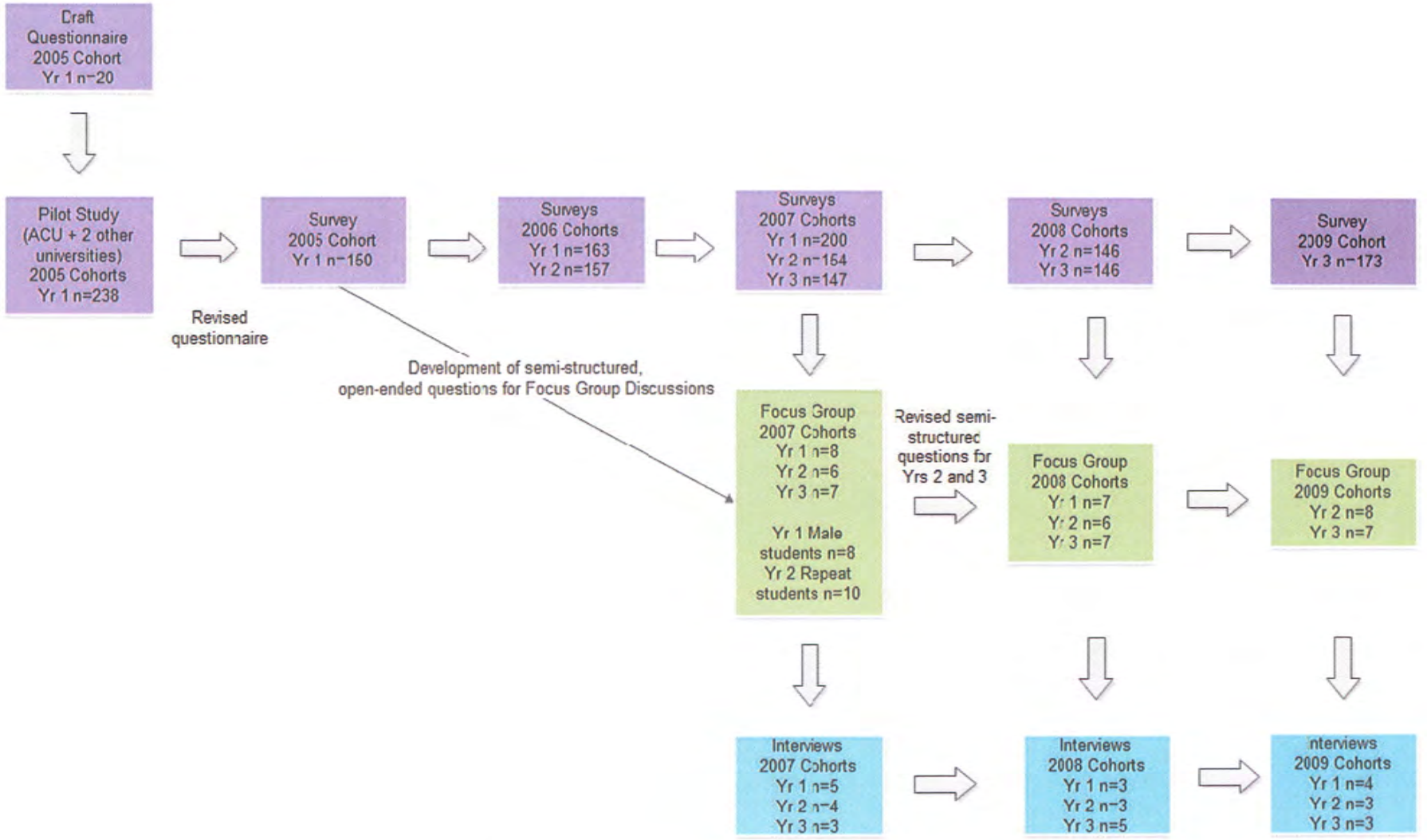


Figure 3.3: Flow diagram showing how the study was conducted and how each phase fitted in

3.5 Pilot study: explorative, comparative research

A draft questionnaire was constructed and validated by pre-testing a convenience sample of 20 students in a first year science tutorial class at ACU (NSW); minor modifications ensured clarity. The revised, brief questionnaire (Appendix B) was thus developed to generate preliminary data, then piloted to identify problems faced by beginning nursing students. Using this questionnaire, a preliminary study "Pilot study of student transition to university" was carried out during September 2004 to June 2005. Although a pilot focus group was not conducted during this period, there were informal discussions with students about their learning experiences. The questionnaire included questions requiring: single out of multiple responses, Likert scale responses (5-point ratings from 'strongly agree' to 'strongly disagree', with a midpoint of 'neutral'), and free-text responses. There were questions relating to students' demographic details, satisfaction with the nursing course, learning strategies used, expectations, perceptions and experiences of first year at university. The demographic questions were designed to derive information relating to age, gender, completion of previous tertiary studies and first/home language. Free-text response questions requested information concerning the hardest part of transition to university learning and any general comments about first year experiences and expectations. In order to determine whether any emerging problem areas were common to all first year nursing students or were related to issues in specific environments, first year nursing science student populations at three metropolitan universities in NSW were sampled towards the end of the first semester in 2005 in this pilot study.

The questionnaire developed for the preliminary study included questions such as "I do preliminary reading before a lecture, tutorial or practical class", "I make additional notes to help me in my study", "I often hesitate to ask questions during a learning session", and "I find it necessary to carry an English dictionary / a medical dictionary / not necessary to carry any dictionaries". These questions were asked to obtain a deeper understanding of how students learnt.

The pilot study informed the development of the questionnaire for the main study (questionnaire surveys for first, second and third year students are presented in Appendix B); the findings of the pilot study were presented at the Australian and

New Zealand Association for Medical Education (ANZAME) Conference (2006) and published (Mehta et al. 2008). The preliminary focus of this study was on first year nursing students' experience of transition to university, development and use of learning strategies, and course satisfaction. It was realised that amongst a heterogeneous body of students some adjusted well to university life, were satisfied with the course, and developed effective study techniques. However, there were many students with diverse needs and concerns, including those who encountered difficulties and needed to make a lot of adjustments to settle into tertiary nursing studies.

3.6 Main study: the survey

The mixed methods design utilised in this triangulated investigation included:

- a questionnaire survey consisting of 39 questions (open-ended, closed ended, and questions requiring scaled, and single of multiple, responses – see Appendix C),
- an evaluative study utilising semi-structured focus groups (6-10 students, lasting 40-60 minutes), and
- in-depth, one-to-one interviews (3-5 interviews per cohort, face-to-face, lasting 20-30 minutes),

in addition to direct observations and listening to students while teaching science units across the three years of the BN degree over the period 2005-2009. Direct observation and listening to students provided valuable information concerning students' attitude, behavior, adaptation to the tertiary environment, and academic performance.

The nature of this investigation into students' expectations and experiences of tertiary study necessitated the analysis of students' demographic details and learning preferences. In order to ascertain whether or not students' perceptions would change as they matured and progressed through the course, a longitudinal study approach was adopted over the three years of the BN degree. The horizontal study served to further test the validity of the data. The target population was undergraduate (first year, second year and third year cohorts) nursing students at ACU. Approximately 85% were female students. Data from a

total of 1448 questionnaire surveys, 10 focus group discussions, and 33 one-to-one interviews were processed and analysed.

3.6.1 Types of data collected

Types of data collected in this study are listed below. Data from questionnaire surveys:

- quantitative *(structured),* ranked (ordinal) data such as Likert scale responses;
- *categorical/nominal* data that existed naturally in categories such as gender or yes/no responses to simple questions; and
- qualitative textual data in response to open-ended questions.

Data from focus group discussions and one-to-one interviews:

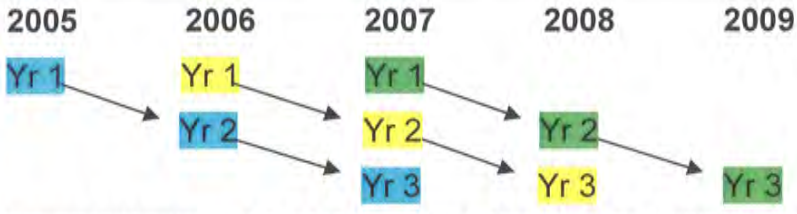
- qualitative *(unstructured)* data such as perceptions, feelings and emotions.

3.6.2 Data collection

The protocol followed for data collection is as given below:

- a horizontal design: studying three cohorts of first year nursing students,
- a longitudinal design: studying three cohorts of first, second and third year students.

Three successive groups (Groups A, B, and C) of Bachelor of Nursing students were studied as they progressed from first year to third year. The data collection schedule for questionnaire surveys is given in Figure 3.4 and that for focus group discussion sessions is given in Figure 3.5.



Group A (blue) consisted of Yr 1 cohort of 2005, Yr 2 of 2006, and Yr 3 of 2007;
Group B (yellow) consisted of Yr 1 cohort of 2006, Yr 2 of 2007, and Yr 3 of 2008;
Group C (green) consisted of Yr 1 cohort of 2007, Yr 2 of 2008, and Yr 3 of 2009;
Winter School students repeating a second year science unit were also surveyed in June 2007.

Figure 3.4: Data collection schedule – Questionnaire surveys

2007	2008	2009
Yr 1	Yr 1	Yr 2
Yr 2	Yr 2	Yr 3
Yr 3	Yr 3	-
Yr 1 (males)	-	-
Yr 2 (repeating students)*	-	-

*In 2007, a session with Yr 2 repeating students was held in Semester 1 and another held in Semester 2.

Figure 3.5: Data collection schedule – Focus group discussion sessions

In 2007, Year 3 questionnaire surveys were started and Year 1 surveys completed; and, special focus group sessions were held: one with only male nursing students and two with only students repeating a second year science unit. An extra focus group session was held in Semester 2 of 2008 for first year students as the first one held in 2007 was considered a learning experience for the researcher. One-to-one, in-depth interviews were conducted mainly in Semester 2 of 2007, 2008 and 2009. For the first, second and third year students, at least three such interviews were held per cohort per year.

Data across all years of this investigation was collected in a consistent manner in terms of phrasing questions in the same way so that responses would be comparable. For Years 1 and 2, the beginning of Semester 2 was chosen to administer the questionnaire survey because it was expected that students would be more settled in the relevant year of their course, and to ensure that the remaining or successful students only were included in the study, as students who drop out typically do so in Semester 1. Students who actually dropped out or who were contemplating withdrawing from the course were not interviewed because it was difficult to access these students. The numbers of science units taught in the BN course were: two in first year, two in second year, and one in third year. The third year cohort completed the survey in Semester 1 as they did not study a science unit in Semester 2.

The reason that it was considered important to execute the research survey at the beginning of semester was to minimise the effects of survey fatigue as students are usually expected to participate in several surveys evaluating several units or teaching towards the end of semester. Furthermore, students are likely to be more relaxed and less stressed at the beginning of a semester than towards the end with examination time imminent. Therefore, it was hoped that the rate of participation in the study would be higher at commencement of the academic term.

3.6.3 Survey development

The main study "Evaluation of nursing students' academic expectations, perceptions and experiences of science at different stages during their undergraduate studies" was conducted from July 2005 to October 2009. The target student populations were all undergraduate nursing students in Years 1, 2 and 3 at the Australian Catholic University (NSW).

Findings from the exploratory study (Mehta et al. 2008), extensive literature review and peer discussions guided the design of a questionnaire for the main study. When formulating survey questions, some open-ended questions requiring free-text responses were included so that the participants' views could be explored. The survey tool that was developed was capable of eliciting specific information on students' demographic details, and their academic expectations, perceptions and experiences. Demographic questions were designed to gather data such as age, gender, family situation/accommodation, language/s spoken, nationality and previous education. Other questions sought information on students' learning preferences and behaviours.

When the questionnaire was first administered to a Year 1 cohort in 2005, several students commented on work commitments impinging on study time. Therefore, a question was added to the questionnaire for subsequent surveys of first, second and third year cohorts, requesting information about hours per week spent in paid employment and time spent on off-campus study.

Data relating to students' expectations, perceptions, experiences and any difficulties affecting their study was generated using open-ended (unstructured, free-text), close-ended (structured), and four-point Likert scale questions (Strongly agree, Agree, Disagree, Strongly disagree). The 'neutral' option was eliminated as it was used too frequently by the students in the pilot study resulting in an unworkable degree of uncertainty in the data. Students needed to select either the 'Strongly agree/Agree' or 'Disagree/Strongly disagree' options or not to respond to a particular question at all if undecided.

Questionnaires used in the main study for the first, second and third year BN students were kept as uniform as possible with only minor variations reflecting the differences in the offering of subjects and teaching modes (*e.g.* Problem-Based Learning, and Self-Directed Learning) - Appendix C.

Sample items from the questionnaire survey used in the main study are presented below.

Example of a question requiring single of multiple responses:
Age
[ ] under 20 [ ] 20-30 [ ] over 30

Example of a question requiring a 4-point scaled response:
I have begun to appreciate the relevance of science to nursing
[Strongly agree / Agree / Strongly disagree / Disagree]

Example of open-ended question:
Do you have or have you had any problems with your nursing science studies? (If yes, please specify) _____

Example of close-ended question:
How often do you read a science textbook?
[Daily / Weekly / Monthly / Occasionally / Rarely]

Example of free-text response:
Any additional comments _____
_____

Although the free-text responses in the pilot study revealed that some students had a fear of learning science, there was no evaluation tool to quantify that element. In order to assess students' perceptions of science, further directed

questions were devised for inclusion in the main questionnaires of the study. For example, questions were formulated to determine students' perception of the value, relevance and integration of science units to clinical units in nursing. Students' perceptions of science were evaluated by utilising a set of questions:

Before commencement of / towards end of Year 1 / end of Year 2 / end of Year 3 of the BN course, which of the following statements best describes your perception of science?
[Important for medical advances / Interesting and relevant / Easy / Manageable / Difficult / Boring]

Which component of first year science do you find most interesting?
[Anatomy & Physiology / Microbiology / Chemistry & Physics / Pathophysiology / Pharmacology]

Which component of first year science do you find most relevant?
[Anatomy & Physiology / Microbiology / Chemistry & Physics / Pathophysiology / Pharmacology]

Which component of first year science do you find most difficult?
[Anatomy & Physiology / Microbiology / Chemistry & Physics / Pathophysiology / Pharmacology]

How often do you read science textbooks?
[Daily / Weekly / Monthly / Occasionally / Never]

How much do you value science units in the nursing program?
[Highly value / Value / Do not value much / Do not value at all]

How well have the science units integrated with the nursing and clinical units you have studied?
[Extremely well / Quite well / Not very well]

I have begun to appreciate the relevance of science to nursing.
[Strongly agree / Agree / Disagree / Strongly disagree)

The main questionnaire was modified by substituting questions to develop Questionnaire 2 (see Appendix E) for surveying second year students repeating a science unit in June 2007. Questionnaire 2 contained questions requesting information on student perception of reasons for difficulty managing studies and helpful learning strategies for the science units.

3.6.4 Distribution of questionnaires

The time and place considered suitable and convenient for distributing questionnaires was at lectures where a large group of students assembled in the lecture-theatre could be surveyed. This venue provided a constant environment, thus eliminating pressures and variability associated with numerous tutorial and practical classes being run by different tutors.

For each survey, copies of the questionnaire were printed for distribution. Permission was sought in advance from science lecturers for distribution of questionnaires, and surveys were conducted at the scheduled lecture times. All BN students present at lecture time at the beginning of semester (usually in Weeks 3 to 5), were invited to complete the questionnaire (as per the sampling schedule in Figure 3.4; also see Appendix D: Summary of trails validity process). Students were assured of the voluntary, confidential, and anonymous nature of the study. Parity was ensured by giving all students equal opportunity to participate in the study, and all students were treated with respect; non-participating students were not identified or disadvantaged in any way. An information letter was distributed together with the questionnaire to all prospective participants; a consent form was made available to any first year nursing student under the age of 18 years, seeking approval by parent/guardian to participate in the research (Appendix G). Privacy was assured as students were invited to anonymously post their responses, at their discretion, in a closed box located near the student common area. An invitation to participate further in a scheduled focus group discussion was also extended (in the years 2007-2009). It was announced, too (in the years 2007-2009), that students could request a one-to-one interview conductible at a mutually convenient time with the researcher in the researcher's office.

As attendance at lectures was not compulsory, lectures were often not well attended (absence rate usually exceeding 35%). Therefore, a short study was designed and conducted to monitor the pattern of attendance of nursing students at lectures; gender differences in lecture attendance was also determined. Data available for attendance of second year students at early afternoon lectures of two nursing science units, BIOL228 and BIOL229, is shown in Table 3.2.

Table 3.2: Second year student attendance at science lectures (Week 3, Semester 2, 2007 cohort)

Science unit /Lecture no.	Total attendance rate % (n)	Male attendance % (n)	Female attendance % (n)
BIOL228			
Lec 1	**50.0** (105)	**58.1** (18)	**48.6** (87)
Lec 2	**41.4** (87)	**58.1** (18)	**38.5** (69)
BIOL229			
Lec 1	**27.2** (68)	**40.5** (15)	**24.9** (53)
Lec 2	**39.2** (98)	**45.9** (17)	**38.0** (81)

Science unit BIOL228 contained a maximum of 31 males and 179 females. Science unit BIOL229 contained a maximum of 37 males and 213 females.

This data indicated that student attendance at lectures for the two second year science units varied between 27.2% and 50.0%. Females were more likely to miss classes than males (this was not statistically significant because of the limited data).

Lectures in the middle of the day were chosen for distributing the questionnaires, as lectures in early morning and late afternoons were usually less well attended.

3.6.5 Validity

Reliability and validity are important considerations in any test or assessment procedure. Validity is a determination of whether or not the research has measured what the researcher was intending to measure; it refers to the accuracy of the inferences or interpretations made from the test scores. Quantitative and qualitative techniques were used sequentially. Hence, initial quantitative data were analysed by descriptive statistics, interpreted, and used to inform a qualitative phase of the study. This approach was used in the horizontal study (studying three cohorts of first year nursing students) and then repeated for the longitudinal study (studying three cohorts of first, second and third year students). This enabled triangulation of results and an ability to check consistency.

Possible threats to validity in research investigations include:

- selection bias (which affects internal validity)
- demand characteristics, or the Hawthorne effect (which affects external validity) – if students know exactly what the researcher is investigating

they may change their behaviour to achieve the goals or outcomes they anticipate the researcher seeks.

Selection bias was avoided as student participation was not enforced; students were considered to be self-selected because of the voluntary nature of the recruitment process.

Validity checks were built into the research design in this mixed methods study in order to improve the accuracy of the findings (Creswell 2003, page 196). Student discussions and surveys were *triangulated* by examining evidence from the qualitative and quantitative data sources and using it to build a coherent justification of themes. The accuracy of the qualitative findings was determined by *member-checking*: the main findings were summarised at the end of student discussions and then read to the participants to determine whether they felt that the findings were accurate. *Rich, thick description* of the findings was used to give the discussion an element of shared experiences. Self-reflection and clarification of the *bias* the researcher brought to the study ensured transparency and reliability of findings. In addition, the researcher spent *a long period* of time (five year duration of study) with the first, second and third year nursing students (the researcher also taught in science units of Years 1, 2 and 3 of the BN course and thus gained first-hand experience, and developed an in-depth understanding, of student feelings and experiences). Finally, findings of the study were presented for *external peer review* through publications and presentations at conferences and research forums.

A trails validity approach as recommended by Richards (2005, page 143) was utilised. A project history (see Appendix D: Summary of trails validity process) was developed in the form of a log of processes to indicate what, when and why any changes were made in the research process - this reflective account indicated: what was achieved, any gaps and unresolved challenges, and how they were addressed; the way the quality and trustworthiness of the research was maintained, and how the data and ideas were handled to promote transparency and consistency.

3.6.6 Reliability

Reliability refers to the consistency or dependability (stability) of the test scores (Johnson & Christensen 2011; Burns 1998). For example, if an instrument was administered to similar groups of students at different times, highly reliable instruments would give similar results (Sanger 2008). In this research project, reliability was established in the pilot study and in the early phase of the main study.

3.6.6.1 Calculation of sample size required that is representative of a target population

An online calculator "Sample Size Calculator" (presented as Survey System software by Creative Research Systems, USA) was used (Creative Research Systems 2010) to check if the sample size (respondents) of the questionnaire survey reflected the target population (students in a cohort).

A larger sample size reflects the target population with more certainty than a small sample. However, for a large target sample such as a cohort of university students, it is not necessary to survey all the students to get a meaningful result of a research question (Creative Research Systems 2010). For instance, the target population of Year 1 cohort of 2007 was 365 students. The sample size needed to reasonably reflect the target population was calculated to be 187 students, using a confidence level (measure of certainty) of 95% and a confidence interval (margin of error) of 5%. Since 200 Year 1 students returned completed questionnaires that year (in 2007), the sample was considered representative of the target population.

3.6.6.2 Calculation of confidence intervals for surveys

A total of nine large nursing cohorts was surveyed in this horizontal and longitudinal study, with each cohort having a target population size of 348-460 students. Excluding survey responses from the preliminary study, 1436 student responses were captured in the main study and additional 12 responses were collected from students repeating a second year science unit. Hence, a total of 1448 questionnaire responses were gathered.

The online calculator (Survey System software by Creative Research Systems, USA) was used (Creative Research Systems 2010) to calculate the confidence intervals for the student surveys. The confidence interval was in the range of 4.64% to 6.25% (Table 3.3), which was considered reasonable – i.e. for the purposes of this study, the sample sizes (survey respondents) were generally representative of the target populations (students in nursing cohorts). However, further checks were performed to determine whether the respondent sample size was representative of diversity of the enrolled cohorts (see section *3.6.6.4*).

3.6.6.3 Calculation of participation rates in student surveys

Based on observations at the time of conducting surveys, the rate of non-completion of questionnaires was estimated at 10% - 15% of students attending lectures. Enrolment, attrition and progression information was obtained from university enrolment data. As questionnaires were administered to nursing students in Semester 2 for Years 1 and 2 students, and Semester 1 for Year 3, the return rates of completed questionnaires were calculated based on the numbers of students enrolled in the science units in the relevant semesters (see Table 3.1). The return rates of completed questionnaires are shown in Table 3.3. Student participation in questionnaire surveys tended to be variable. A higher participation in surveys would have been desirable, but was not feasible as student participation in this study was voluntary and attendance at lectures was not mandatory. The relatively low participation rates, particularly for the Year 2 cohorts of 2007 and 2008, were related to both poor attendance at lectures and choice not to complete the questionnaire as students realised and exercised their academic freedom.

Table 3.3 Student participation rates in questionnaire surveys, **%** (n)

Year	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
2005	**39.6** (150) [6.09]	-	-
2006	**46.8** (163) [5.59]	**39.1** (157) [5.97]	-
2007	**54.8** (200) [4.64]	**33.5** (154) [6.09]	**37.2** (147) [6.20]
2008	-	**33.2** (146) [6.25]	**36.0** (146) [6.24]
2009	-	-	**40.6** (173) [5.65]

[Confidence interval, %]

3.6.6.4 Calculation of Yates' Correction for Continuity

In the further checks performed to determine whether the respondent sample size was representative of the enrolled diverse cohorts, the differences in distribution of gender, age and linguistic background for the enrolled population and the respondent sub-population were tested for statistical significance – see Table 3.4. For each of these demographic factors analysed, there are only two categories (for example, the demographic factor, age has the two categories "school-leavers" and "mature-aged"). Where there are only two categories in a distribution, there is only one degree of freedom (df). Hence, the calculated value of the test statistic (χ^2) is too high, requiring a correction called Yates' Correction for Continuity (Osborn 2006; Fowler et al. 1998). This involves subtracting 0.5 from the numerator of each component of the chi-square formula before squaring. The subtraction is made from the *absolute value* of the difference (O-E), that is, any minus sign is ignored. This is written as:

$$(|O - E| - 0.5)^2$$

where the vertical bars mean *absolute value* (See Appendix H for example of such a calculation).

With the Yates' correction, the equation becomes: $\chi^2 = \sum \left[\frac{(|O-E| - 0.5)^2}{E} \right]$

Table 3.4: Comparison of demographic factors (gender, age and linguistic background) of survey respondents and enrolled students: combined data of three first year nursing cohorts

Demographic factor	Students enrolled in Yr 1 science unit % (n)	Respondents in study % (n)	p	χ^2	df
Gender					
Male	**16.1** (176)	**14.4** (74)	>0.05	1.039*	1
Female	**83.9** (916)	**85.6** (439)	NS		
Age					
School-leavers	**20.1** (220)	**20.5** (105)	>0.05	0.028	1
Mature-aged	**79.9** (872)	**79.5** (407)	NS		
Linguistic background					
ESB	**48.4** (528)	**62.7** (301)	<0.01	39.14	1
NESB	**51.6** (564)	**37.3** (179)	S		

ESB: English-speaking background; NESB: non-English-speaking background;
S: statistically significant difference; NS: non-significant difference
* Calculation shown in Appendix H

Table 3.4 shows that the respondent sample was representative of the enrolled sample in terms of student gender and age. However, significantly more English-speaking students, than students from NESB, participated in the surveys.

3.6.7 Processing survey data

The completed, returned questionnaires were numbered in ascending order, each submission representing a *case* (or a student record). Data was transformed into numbers prior to recording in Microsoft Office Excel 2007 database. Gender was *nominated* in a non-ordered way, *i.e.* 1 = male and 2 = female (note: there is no implication that 1 is ordered higher than 2). For data management and analysis of ordinal variables, *e.g.* frequency of reading science textbooks - "daily", "weekly", "monthly", "occasionally", "never", values were ordered in a logical way in providing a relative ranking:

1 = never, 2 = occasionally, 3 = monthly, 4 = weekly, 5 = daily

The raw Likert scale data was processed by collapsing the 4-point scales into 2-point ordinal scales (*ie* 1 = Disagree/Strongly disagree and 2 = Agree/Strongly agree) in order to quickly sort and simplify information to get an overall indication of potential problems and for the purpose of reporting. A detailed analysis of

student responses to selected variables was made possible by processing all 4-point scales as necessary.

The survey data was stored electronically as Microsoft Office Excel 2003 files and subsequently as Excel 2007 files.

3.6.8 Cohort analysis: analysis of categorical and ordinal data

The quantitative data was imported from Excel spreadsheets into PASW Statistics 18 and then analysed. Descriptive statistics were used to analyse demographic information; frequencies were computed for all scales. Chi-Squared (2-sided) and Fisher's Exact (1-sided) tests were computed using the Statistical Package for the Social Sciences (SPSS) version 14 (and subsequently Predictive Analytical Software, PASW Statistics 18) to test the significance of differences obtained between responses of ordinal (ranked, Likert scale) variables. Nominal (categorical) variables were also tested by these non-parametric tests. Statistical significance was recognised when $p < 0.05$.

The data for the cohort was pooled for analysis when sample size was small or when an overall indication was sufficient (such as response to questionnaire item "Do you think you will continue and complete the BN course?"). Where response to a questionnaire item was missing for a particular case, that student/case was omitted from tabulations requiring the particular information. Qualitative data was pooled for cohort analysis - for example, focus group discussion question to male students: "Would you comment on being a minority in a female dominated cohort?".

3.6.9 Rationale for the statistical tests used

Non-parametric methods such as the Chi-Squared test and Fisher's Exact test were used to assess categorical and ordinal data. Non-parametric statistics (opposite of parametric statistics) include *distribution free* methods which do not rely on assumptions that the quantitative data are drawn from a given probability distribution (Corty 2007, page 461). Since the Chi-Squared test (χ^2) is non-parametric, it is not necessary to make the parametric assumptions that the data

is normally distributed, and that the variances among groups are homogeneous (Sanger 2008).

The Chi-Squared test is used for data at the category or frequency level to test the difference in proportions in two or more independent groups. The test can compare subjects in a particular sample to specific values (goodness or fit test) or to subjects in one or more independent samples (test of independence). When the sample size is too small for the Chi-Squared test, PASW Statistics 18 uses Fisher's Exact test, which is an exact probability test (Polit 2010; Huizingh 2007, page 251; Swinscow & Campbell 2002).

In this research, Chi-squared analysis was mainly used as a test of independence. For instance, the significance of difference between "quite well" and "not very well" responses to the questionnaire item "How well have the science units integrated with the nursing and clinical units?" was tested by the Chi-Squared test. This test was also used to assess the significance of the difference between cohorts (for example, between first and second year, or second and third year, *etc*) to a given response such as "extremely well". Another example of the use of the Chi-Squared test in this study was for comparing student responses to questionnaire items having a Likert scale format.

For the three first year cohorts, a comparability study was carried out using the Chi-Squared test. Similarly, the data of the three second year cohorts, and the three third year cohorts, were tested for comparability and consistency of responses.

3.6.10 Testing questionnaire data for comparability between cohorts

Using the Chi-Squared difference test, a comparability study was carried out to test if the overall findings of the three cohorts were similar for each year (stage) of BN course. Data was randomly chosen and then tested for comparability of responses between the three cohorts; sample data are presented below. The comparison of student responses to the questionnaire item: "Should High School Biology be a requirement for entry into the BN course?" shows that the differences in responses between the three cohorts for each stage of the BN degree were not

significant ($p > 0.05$) - in other words, responses of the three cohorts were comparable (Table 3.5).

Table 3.5: High School Biology prerequisite for entry to BN course

Year/ Response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)	p
Year 1	2005	2006	2007	
Yes	**71.6** (106)	**70.4** (112)	**71.6** (139)	0.088
No	**28.4** (42)	**29.6** (47)	**28.4** (55)	0.428
Year 2	2006	2007	2008	
Yes	**69.5** (107)	**75.2** (115)	**73.0** (103)	0.398
No	**30.5** (47)	**24.8** (38)	**27.0** (38)	0.329
Year 3	2007	2008	2009	
Yes	**70.6** (101)	**72.5** (103)	**75.1** (127)	0.085
No	**29.4** (42)	**27.5** (39)	**24.9** (42)	0.739

Table 3.6 shows student responses to the questionnaire item: "How important is it to understand the science behind nursing principles?" The student responses between cohorts were similar (differences were not significant). Similar confidence values were reached for all questions in surveys.

Table 3.6: Importance of understanding science behind nursing principles

Year/ Response	Group A % (n)	Group B % (n)	Group C % (n)	p
Year 1 cohorts:	2005	2006	2007	
Not important at all	**0.7** (1)	**0.0** (0)	**0.0** (0)	1
Not very important	**5.4** (8)	**3.7** (6)	**3.7** (6)	0.791
Important	**43.2** (64)	**42.7** (67)	**40.0** (64)	0.861
Very important	**50.7** (75)	**55.2** (90)	**56.3** (90)	0.243
Year 2 cohorts:	2006	2007	2008	
Not important at all	**1.3**(2)	**0.0** (0)	**0.0** (0)	1
Not very important	**3.2**(5)	**3.9** (6)	**2.1** (3)	0.727
Important	**31.8**(50)	**29.7** (46)	**37.2** (54)	0.424
Very important	**63.7**(100)	**66.4**(103)	**60.7** (88)	0.278
Year 3 cohorts:	2007	2008	2009	
Not important at all	**0.7** (1)	**0.0** (0)	**0.0** (0)	1
Not very important	**1.4** (2)	**2.7** (4)	**1.2** (2)	0.688
Important	**28.8** (42)	**24.7** (36)	**30.8** (53)	0.072
Very important	**69.2**(101)	**72.6**(106)	**68.0**(117)	0.279

3.7 Main study: focus groups and interviews

3.7.1 Developing structure of focus group discussion

Focus groups are guided group discussions structured to generate a rich understanding of participants' experiences and beliefs (Morgan & Krueger 1998). Such groups facilitate comparison and afford insights that would not be provided by other research methods alone. Student participants may feel more confident in the presence of others sharing the same situation or similar views. The approach involving the use of focus group discussions is a reflective research framework or action research model. In this framework an action is planned, articulated, implemented and then reflected upon (Barbour 2007; Creswell 2003; Webb & Kevern 2001). In this case, the action was the teaching of science to nurses and the reflection on their experiences during a period of change within the university.

The development of the semi-structured questions for the focus groups and interviews in this study was informed by quantitative analysis of the pilot survey. Nursing students had briefly indicated that they were experiencing difficulties with studying science in their undergraduate study, by their free-text responses such

as "science too hard", "fast-paced", and "huge content". As students do not always respond to paper questions requiring free text responses, nursing students were invited to participate in small semi-structured focus group discussions. Certain other students chose to be interviewed on a one-to-one basis as they wished to engage in an in-depth conversation, or simply were not available at the scheduled times of focus group discussion sessions.

At the end of the distribution of questionnaires during lecture time, an invitation was extended to all students who were present to participate further in focus group discussions. There were few volunteers and the subsequent small focus group (six to ten students) discussions ran for 40 to 60 minutes. There was at least one focus group discussion session per cohort per year. Occasionally, specific focus group discussion sessions were held, one session for students repeating a science unit, and another for male students only. Students were asked to comment on their study expectations, perceptions and experiences, including experiences in science, whether they valued science, learning strategies used, any problems encountered, *etc.* Sample questions are provided in Figure 3.6; the full list of questions asked in focus group discussions is in Appendix F. In order to elicit more directed responses, student responses were reviewed and revisions made to questions for subsequent focus group sessions. However, students' responses tend to be very subjective, and the effectiveness of reviews and revisions in improving the quality of semi-structured discussions was a gradual and evolving process, dependent on the sample composition and the students' comments.

General questions

How do the science units compare or fit in with other nursing or clinical units in your course? Is there a good integration of science?
What difficulties did you have in your study of science? How did you cope with any difficulties that you experienced?
In what ways can learning science be made easier and more interesting?
What strategies do you use to learn the difficult topics in science?
Which of the teaching modes in science did you find most effective or useful?

Questions asked in discussion with male nursing students

What motivated you to choose nursing?
What was your perception of nursing studies before you started the course, and what is your experience of first year of the course?
What is your experience of transition to university studies: did you have to make any or many adjustments to settle in study this semester?
Would you comment on being a minority in a female dominated cohort?

Questions asked to students repeating science unit

Why do you think you failed the science unit?
What could have prevented you from failing?
How can we help you to pass science-based units?

Figure 3.6: Focus group discussion - Sample questions

The initial focus group discussion in this study was a learning experience as it informed modifications in technique and development of open-ended questions for the subsequent sessions, which were kept constant as far as possible in order to facilitate comparison of student responses.

Direct observations and listening to students throughout the study period (2005-2009) provided a body of information regarding non-participant data of students' learning behaviour, which was recorded when available (upon availability of meaningful data) in a "Memos" folder in NVivo. All qualitative data was coded for thematic analysis.

In the present study, opportunistic sampling was considered appropriate for gathering qualitative data; students self-selected to participate in the focus groups (see sampling frame in section *3.7.1*). Only the small numbers of students who were confident, articulate and available at the chosen times participated in the focus groups. Inclusion of larger numbers of students, although desirable, was not feasible as participation was, of necessity, voluntary. Since sampling was

opportunistic, there was no control over group composition. A notable problem was that students with poor attendance patterns (which may have been for a range of reasons) were generally not included in the study. It was also noted that students who attended a focus group discussion or a face-to-face interview only participated once during the three years of undergraduate study; therefore, there was no opportunity to carry out any follow-up study on such participants.

3.7.2 One-to-one interviews

The in-depth, one-to-one interviews were subsequently (Semester 1, 2007) added to the research design when it became clear that some students felt that they wished to participate individually, for personal reasons (such as poor study habits or issues relating to their learning of science), were not comfortable in a focus group setting, or because of time constraints due to various commitments (such as care of relative, or being engaged in paid employment) that prevented them for attending a scheduled focus group session. In interviews, questions asked were similar to those in focus group discussions. Other themes for one-to-one interviews included "difficulties understanding science", "developing effective learning strategies", "work and/or family commitments hindering learning", and "being a male nursing student".

For students who participated in one-to-one interviews, no follow-up interviews were enforced. However, students left knowing that the researcher welcomed further discussion if the student considered it necessary. Unfortunately, no student returned for further correspondence.

3.7.3 Conducting student discussions

Semi-structured focus group discussion sessions (with 6-10 students, lasting 40-60 minutes, one per cohort per year) and in-depth, one-to-one interviews (3-5 students per cohort, each 20-30 minutes in duration) were conducted at the beginning of semester for first, second and third year cohorts in 2007-2009 (as per sampling schedule in Figure 3.5; also see Appendix D: Summary of trails validity process) to canvass information on students' expectations and perceptions of learning and other issues. In addition, there were a few specific focus group discussions conducted in 2007: one session for first year male nursing students

as some problems seemed specific to male students, and two sessions for students repeating a second year nursing science unit to determine why they failed their first attempt, what could have prevented their failure, and how they could be assisted to pass science-based units. The numbers of students present at focus group discussions, their year of study and other relevant details are shown in Table 3.7.

Table 3.7: Numbers of students attending focus group discussions

2007	2008	2009
8 (Yr 1)	7 (Yr 1)	8 (Yr 2)
6 (Yr 2)	6 (Yr 2)	7 (Yr 3)
7 (Yr 3)	7 (Yr 3)	-
8 (Yr 1, Males)	-	-
10 (Yr 2, Repeating)	-	-

Comfortable, private, medium-size rooms that could accommodate a group of a dozen or so people were selected for holding focus group discussions - Photograph 3.1.

Photograph 3.1: Focus group discussion session with first year nursing students
(Photograph used with students' permission)

Light refreshments were provided at the start of the meeting. The purpose of the focus group discussion and how the information would be used was explained. Permission to use an audio-recording device (digital voice recorder), and to write short notes, was requested. The moderator (researcher) started the discussion by formally welcoming the students and explaining the purpose of the research project. Then, the moderator maintained an enthusiastic and lively approach to encourage participation in the discussion through appropriate use of up to ten open-ended questions (see Figure 3.6 and Appendix F), eye-contact, gestures and words. While interest was shown in the participants' discussion, the moderator was careful to react neutrally to verbal and non-verbal responses. The discussion was kept on track by the moderator asking relevant questions, thanking a participant for his/her contribution and controlling the time allocated to various topics under investigation.

The focus group sessions were digitally recorded using an iPod recording device (Apple Nano, 30 GB; attached to a MICROMEMO microphone), and later transcribed as Microsoft Word documents. Verbatim transcription was checked for accuracy by playing back the digital recordings repeatedly. Brief notes were also written during each session. At the completion of each focus group session, the moderator used the notes written during the session to summarise the main issues raised, checked for agreement amongst the group, and expressed thanks. A Certificate of Participation was issued to all respondents of the focus groups, acknowledging their contribution to the research.

Similarly, brief notes were taken during one-to-one interviews and were relayed back to the student participant at the conclusion of the interview for validating the notes. Such sessions tended to be confidential and, therefore, not audio-taped so as to avoid distracting the student from revealing sensitive information. The frequency of one-to-one interviews was three to five students per cohort – Table 3.8.

Table 3.8: Numbers of students attending one-to-one interviews

Cohort	2007	2008	2009
Year 1	5	3	4
Year 2	4	3	3
Year 3	3	5	3

One-to-one interviews were held in the privacy of the researcher's office at a time that was mutually convenient for the student and the researcher. A Certificate of Participation was issued if requested.

Observation notes were recorded in a "Memos" folder of NVivo.

3.7.4 Analysis of qualitative data

Qualitative data consisted of student comments from focus group discussions, one-to-one interviews and the free text responses in questionnaires. The one-to-one interviews were held separately to the focus group discussion sessions.

An iPod-dock was used to play back the digital audio-recordings of focus group discussions for transcription. All qualitative notes were transcribed and stored as Microsoft Word documents. NVivo version 7 (and subsequently version 8) was used for content and thematic analyses, organisation and interpretation of qualitative data. Image files, audio files, transcripts and other qualitative data were imported into NVivo. A research project diary was maintained in one of the "Memos" folder of NVivo, and assisted the development of the "Trail validity" (see Appendix D: Summary of trails validity process).

The NVivo software was utilised to categorise the qualitative data: the data was coded and then organised in the form of free nodes and tree nodes. The coding framework used tree nodes such as "Student perceptions", "Student expectations", and "Student experiences". The free nodes separated the qualitative data into the following themes: student perceptions of tertiary study, perceptions of nursing, perceptions of science, perceptions of teaching, experiences of learning at university, experiences of learning science, learning strategies, career aspirations, and language difficulties. Data was linked to memos

or other items; models (concept map or mind map) were built to explore ideas and represent them visually.

Thematic analysis was complemented by online software called Wordle (www.wordle.net), which creates "word clouds" from the text that is provided; the clouds give greater prominence to words that appear more frequently in the source text by varying the size of font. Variation in font size allows words to be linked and themes to be identified and confirmed.

The Wordle program allowed distracting or unwanted words to be deleted from the word clouds. Therefore, words such as "Moderator", "Voice/Speaker no.", and unnecessary sounds such as "Umm..." and "Ah..." in the transcript of the focus group discussions were omitted to make the word clouds more relevant and meaningful. It was also possible to customise the pattern of the word clouds and change the colour scheme to enhance the display. Data from the focus groups were analysed separately first, then together to create "word clouds" (see Figures 5.1 and 5.2).

In addition to the brief notes taken and the transcription of the student discussions, the researcher carried out subjective evaluation and analysis of qualitative data; focus group discussions and one-to-one in-depth interviews were analysed at a more subtle level in the form of observation of body language clues and other non-verbal forms of communication. There is a potential risk in such subjective evaluation in that researcher bias may compromise the value of qualitative data generated (Barbour 2007; Minichiello 2004). However, extreme caution was exercised to avoid any partiality or prejudice; an ethical and professional approach was adopted during discussion with students in that utmost attention, respect and courtesy were extended to all participants. Regardless of the careful, professional approach of the lecturer (researcher), it is possible to be unintentionally biased. Furthermore, in a focus group discussion, students may sometimes respond according to what they think the researcher wants to hear.

In order to ensure that my own thoughts did not interfere in my judgments of qualitative data, all qualitative data (from focus groups, interviews, responses to

open-ended questions in surveys, and direct observations) were analysed separately then collectively to identify emerging themes, and then compared with findings from literature and/or discussed with other researchers (e.g. research supervisors, and at conferences).

Some constraints and challenges apply to qualitative research methods such as focus group discussions and one-to-one interviews. Analysing focus group data was challenging as the group data tended to be inherently complex: discussions occurred at more than one level depending on the dynamics of the group, and served multiple functions for the individual participants engaged in co-constructing a response. Clusters of friends with similar opinions may have attended a focus group session together, and some participants may have been influenced by peer pressure in their decision to express, or not express, their views. As the researcher was a lecturer in some of the units studied, this could also have influenced student comments. There were other complexities such as potential stigma regarding talking openly to the researcher. Many students hold lecturers in high esteem, and may be unwilling to express negative views fully ("self-censorship"), either out of culturally determined respect for the lecturer or fear of their grade being affected. It is possible that self-censorship fades away over time, especially if the researcher becomes taken for granted by informants and/or becomes integrated into the community being studied. An important effect of time was that the researcher became progressively more skilled at leading focus groups and extracting information pertinent to this study.

In a focus group setting, participants' views and attitudes tend to be very subjective, changeable (depending on the group composition and environment) and have the potential to affect the overall findings (Smithson, 2000). Therefore, focus group discussion as a research instrument is not intended to provide a means of accurately measuring all attitudes, nor do they provide data amenable to statistical generalisation. Views expressed in focus group discussions may be different from the private views disclosed in one-to-one interviews (Smithson 2000).The nature of focus group discussions means that stories are unlikely to unfold sequentially, as they can do in a one-to-one interview. Some participants who would be reluctant to attend a group session may feel more comfortable

talking to the researcher in a one-to-one situation. One-to-one interviews are capable of eliciting contextualised information, some of which may be very subjective and confidential (Minichiello 2004). Interviews are a "conversation with a specific purpose", particularly in-depth interviewing because it allows the informants to speak freely so that the interviewer can elicit their authentic experiences (Minichiello 2004). The results are usually expressed in the informant's own words as the data collected is from the informant's personal experience and not the researcher's interpretation of it.

Although every attempt was made to maintain consistency from year to year in this study, some forms of bias (such as lecturer-student bias, gender bias, or cultural difference bias) were unavoidable. Further to the issue of lecturer-student bias discussed above, there was the possibility of gender bias (note that the researcher is a male, who may not have been attuned to all the problems affecting female students). A female participant may have responded differently in an in-depth interview had the interviewer been a female and vice versa. Nursing cohorts predominantly consisted of female students - this was also reflected in the focus groups which were dominated by female students. The multicultural nature of the student body implied potential for a cultural difference bias. However, students generally embraced an amiable etiquette.

Throughout most of the study period, the role of the researcher was that of an academic. No obvious difficulties were experienced personally in switching between the roles of teaching or research. Students were probably more aware of the researcher role only at the time of data collection. A researcher's observations are not the results of a study, but data to be interpreted. A frequent criticism of qualitative studies such as focus group discussions is that the 'observer effects' (also referred to as 'researcher effects' or the 'Hawthorne effect') will somehow bias research findings (Spano 2005), or contaminate the supposedly pure social environment being studied (Hunt 1985). Despite 'observer effects', focus groups can and do generate important data and critical insights. Informants' responses to the researcher are important data that reveal a great deal about the population being studied. In attempting to minimise the 'observer effects', researchers may be restricting their access to rich data in the field (Spano 2005). Some of the

greatest strengths of qualitative research lie in cultivating close ties with the sample population and dispelling the illusion that robust data are best achieved through distance (Monahan & Fisher 2010). Through participation, the field researcher sees first-hand how students grapple with uncertainty, how meanings emerge through talk and collective action, and how understandings and interpretations change over time (Emerson et al. 1995). It is the researcher's close proximity to and interaction with informants, rather than distance and separation, that affords the transformation of 'observer effects' from distasteful bias to serendipitous boon (Monahan & Fisher 2010).

3.8 Chapter review

As both, quantitative and qualitative research approaches are valuable and effective, the mixed methods methodology was considered most appropriate for this investigation. Multiple methods were used, ranging from questionnaire surveys and student discussions to direct observations in class. The interpretive research involved engagement in the research situation, made possible as the researcher also taught nursing science units to the first, second and third year students during the course of this study. These approaches reduced the intrinsic bias that can occur from single method, and justified the analysis and interpretation of the complexities associated with nursing students' study habits and preferences for teaching mode and science subjects.

This study was large in that it incorporated 1,448 student responses over a five year period. The longitudinal nature of the study was necessary to allow analysis of how/if students' perceptions, expectations and experiences of nursing science evolved during preregistration years; and to determine whether the results of cohort analysis were consistent from year to year.

Chapter 4

Discussion of Results - Nursing Students' Demographic Information (2005-2009)

Chapter 4: Discussion of Results - Nursing Students' Demographic Information (2005-2009)

4.1 Introduction

The findings from a combination of quantitative and qualitative data, collected by the mixed methods approach (explanatory sequential design), contributed to the outcomes reported in this study. Proceeding from descriptive to inferential analysis, output from quantitative data analysis will be presented using figures, tables and graphs. In addition, the themes arising from the qualitative analysis will be presented in text and diagrammatic formats.

The aims of this study were to:

- investigate the composition of tertiary undergraduate nursing student cohorts in the early 21st Century;
- develop awareness of the 21st Century nursing students' academic expectations, perceptions and experiences of learning science;
- examine undergraduate BN students' study behaviours and investigate whether they change over the duration of the course;
- identify the problems and challenges that large cohorts of undergraduate nursing students face as a consequence of the rapid unplanned changes due to the sudden expansion in the BN course;
- identify the effects of factors such as gender, age, and ethnic background on learning strategies and trends in students' expectations, perceptions and experiences of the BN and, in particular, of learning science;
- analyse how/or if students' perceptions and values, particularly of the science content, change or evolve over the duration of the BN course.

In this chapter, the composition of the tertiary undergraduate nursing student cohorts (2005-2009) is described by presenting demographic information such as students' gender, age, ethnic background, living arrangements, and employment practices. The remaining aims are covered in Chapter 5.

The Australian Government responded to the national shortage of nurses by increasing funding for additional places (including increasing intake of international students) and resources for undergraduate nursing courses, particularly between 2002 and 2008 (Drury et al. 2009). This led to increases in cohort sizes in Australian nursing programs (Salamonson & Andrew 2006; Nugent et al. 2004). The pattern of increasing enrolments in Bachelor of Nursing courses is evident in universities in NSW, Table 4.1.

Table 4.1: Undergraduate nursing enrolments in universities in New South Wales

	2005 n	2006 n	2007 n	% increase
Australian Catholic University (NSW)	539	573	601	11.5
University of Newcastle	373	434	503	34.9
University of Technology, Sydney	300	436	465	55.0
University of Western Sydney	875	799	939	17.5
University of Wollongong	216	204	232	13.7

The information presented for the period 2005 to 2007 corresponds to the study of first year nursing cohorts in this investigation at ACU (NSW). The % increase values for Australian Catholic University (NSW), University of Newcastle and University of Technology (Sydney) are between 2005 and 2007. The % increase values for University of Western Sydney and University of Wollongong are between 2006 and 2007.

The maximum increases in nursing enrolments in NSW universities are between 11.5% and 55.0% within the period 2005 to 2007. There was a 69.5% increase in enrolments in the Faculty of Health Sciences offering the Bachelor of Nursing program at Australian Catholic University (ACU) in NSW over the period 2004 to 2007 (ACU Annual Report 2008). This is made up of a 58% increase between 2004 and 2005, and an 11.5% increase between 2005 and 2007. The increased enrolments (and the corresponding increase in cohort sizes) at ACU (NSW) were largely due to relaxation of entry requirements into nursing, increased intake of international students (Wright & Gollan 2008), and coincided with the closure of the undergraduate nursing program at the University of Sydney (Gillard 2004). Between 2005 and 2007, the published Universities Admission Index (UAI) for entry to nursing at ACU (NSW) varied between 64.1 and 64.0 (data obtained from Admissions Office, ACU), but the actual cut-off may probably have been less (even below UAI of 60). The UAI of 64.0 to 64.1 corresponds to the current Australian Tertiary Admission Rank (ATAR) of 67.05 to 67.15. A large proportion of this heterogeneous body of nursing students comprised mature-aged,

undergraduate students from culturally and linguistically diverse (CALD) backgrounds. Photograph 4.1 shows a group of ACU nursing students in 2005.

Photograph 4.1: Australian Catholic University nursing students (2005)
(Photograph used with students' permission)

Many students who enrolled into nursing came from various educational backgrounds and had prior career interests across the spectrum of health, commerce, education, and information technology.

In this chapter, demographic factors are addressed to investigate the composition and characteristics of the heterogeneous body of nursing students at ACU (NSW) during the period of rapid change that formed the basis of this study. Three successive first year cohorts (2005, 2006 and 2007) were followed through the full three years of the Bachelor of Nursing (BN) course. Nursing students' career choices and aspirations are described, and their commitments to paid work are discussed.

Although entire cohorts were welcome to participate in the questionnaire surveys, the demographic information presented in this chapter is based on the data collected from responding students. For the first year cohorts, the demographic information of gender, age and linguistic background of respondent sample and of the enrolled sample (total number of students) was compared and statistically tested for similarity.

For the purpose of this study, school-leavers are defined as having accessed tertiary education within a year of completing high school, and mature-aged students as those who delayed their tertiary enrolment more than one year after completing high school and are typically aged 21 or over. It cannot be assumed that all CALD students are full fee-paying international students as many may have acquired Australian Resident status before commencing their BN studies. For the purpose of this study, international students are those residing in a country other than Australia and who have come to Australia to study at ACU (NSW) on a Student Visa. Not all international students may have difficulty with English language; for instance, students from Commonwealth countries and the USA generally have fluency in English.

4.2 Gender distribution in nursing cohorts (2005-2009) at ACU (NSW)

4.2.1 Gender distribution in first year cohorts

Between 2005 and 2007, there was an increasing trend in absolute numbers of male enrolments (Table 4.2). There was also an increasing trend in the rate of student participation in the current study. For instance, the voluntary participation rate of male students in this study ranged from approximately 22% to 33% of males enrolled across the three successive first year cohorts.

Table 4.2: First year nursing cohorts by gender

		2005	2006	2007
Total enrolments	(n)	403	356	364
Male enrolments	(n)	82	98	101
Female enrolments	(n)	321	258	263
Male participants	% (n)	**22.0** (18)	**23.5** (23)	**32.7** (33)
Female participants	% (n)	**41.1** (132)	**54.3** (140)	**63.5** (167)

4.2.2 Increasing male enrolments in nursing

In the period 2005 to 2007, a disparity was noted between the professions of nursing and medicine in that there was a small increase in male enrolments in

nursing compared to a drop in male enrolments in medicine at most NSW universities. Between 2005 and 2007, male students comprised 9.7% - 23.3% of the cohorts in pre-registration nursing courses, while male enrolments in undergraduate medicine comprised approximately 40-50% - Table 4.3.

Table 4.3: Numbers of males in undergraduate medicine and nursing at NSW universities

	2005 **%** (n)	2006 **%** (n)	2007 **%** (n)
Males in Medicine			
University of New South Wales	**46.9** (111)	**41.6** (107)	**45.5** (125)
University of Newcastle	**48.0** (60)	**49.5** (55)	**39.8** (45)
University of Western Sydney	*	*	**45.2** (47)
Males in Nursing			
Australian Catholic University (NSW)	**15.2** (82)	**17.1** (98)	**16.8** (101)
University of Newcastle	**15.8** (59)	**15.2** (66)	**16.1** (81)
University of Technology, Sydney	**16.3** (49)	**18.8** (82)	**20.2** (94)
University of Western Sydney	**20.2** (177)	**22.8** (182)	**23.3** (219)
University of Wollongong	**9.7** (21)	**10.3** (21)	**12.5** (29)

* Course not offered

The numbers of commencing male students increased from 82 to 101 (23.2% increase) over the three year period beginning 2005. Despite the large increase in cohort size throughout this period, the proportion of male nursing students remained steady at 15.2% to 17.1%. The steady increase in nursing enrolments was more marked at universities in Sydney (being a large cosmopolitan city), e.g. University of Western Sydney and ACU (NSW), compared to universities in other smaller cities such as Newcastle or Wollongong.

4.2.3 Gender information of student populations studied: three successive cohorts of Years 1, 2 and 3 during period of study, 2005 – 2009

The gender data obtained from participating students of three cohorts each of the first, second and third year Bachelor of Nursing (BN) students for the period 2005 to 2009 in this study (ACU, NSW) is shown in Table 4.4. It is evident that male nursing students constitute a minority.

Table 4.4: Gender data for BN cohorts

Gender	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
Year 1	2005	2006	2007
Female	**88.0** (132)	**85.9** (140)	**83.5** (167)
Male	**12.0** (18)	**14.1** (23)	**16.5** (33)
Year 2	2006	2007	2008
Female	**89.2** (140)	**75.3** (116)	**86.3** (126)
Male	**10.8** (17)	**24.7** (38)	**13.7** (20)
Year 3	2007	2008	2009
Female	**81.4** (118)	**78.8** (115)	**83.8** (145)
Male	**18.6** (27)	**21.2** (31)	**16.2** (28)

Between 83.5% (167) and 88.0% (132) of beginning nursing students (2005 – 2007 cohorts) surveyed were females, although numbers of male students increased slowly but steadily from 12.0% (18) to 16.5% (33) of first year cohorts over the three years ($p < 0.05$). The gender distribution of the three first year samples (survey respondents) was similar to that of the total number of students enrolled in the Year 1 science unit – Table 4.5.

Table 4.5: Combined data of first year cohorts (2005-2007) showing comparison of gender distribution in enrolled and respondent samples

Gender	Enrolled sample* **%** (n)	Respondent sample **%** (n)	χ^2	df	p
Females	**83.9** (916)	**85.6** (439)	1.0385	1	>0.05
Males	**16.1** (176)	**14.4** (74)			NS

*Data obtained from University Statistics. NS = non-significant difference

A gender ratio of 87.3% females to 12.7% males was reported based on aggregate (7365 students) demographic profile of undergraduate nursing students in Queensland and South Australia at census, 31st March 2006 (Gaynor et al. 2008). However, the nursing student body no longer constitutes young, predominantly female school-leavers. The number of males enrolling in nursing courses has increased (Mehta et al. 2008, Stott 2007; Yang et al. 2004), and increases in numbers of mature-aged and international students entering nursing

courses are particularly evident at the universities in NSW where the BN is taught (Croxon & Maginnis 2007; Asmar 2005).

4.3 Age profile of nursing student populations in study (2005-2009)

4.3.1 Age of beginning nursing students

There was a wide variation in the ages of commencing nursing students at ACU (NSW), ranging from school-leavers to men and women who held previous occupations. Data on student age was collected from questionnaire surveys in which three age brackets: "under 20 years", "20 to 30 years" and "over 30 years" were used. The ages of the first year BN students (respondents in this study at ACU, NSW) are presented in Figure 4.1.

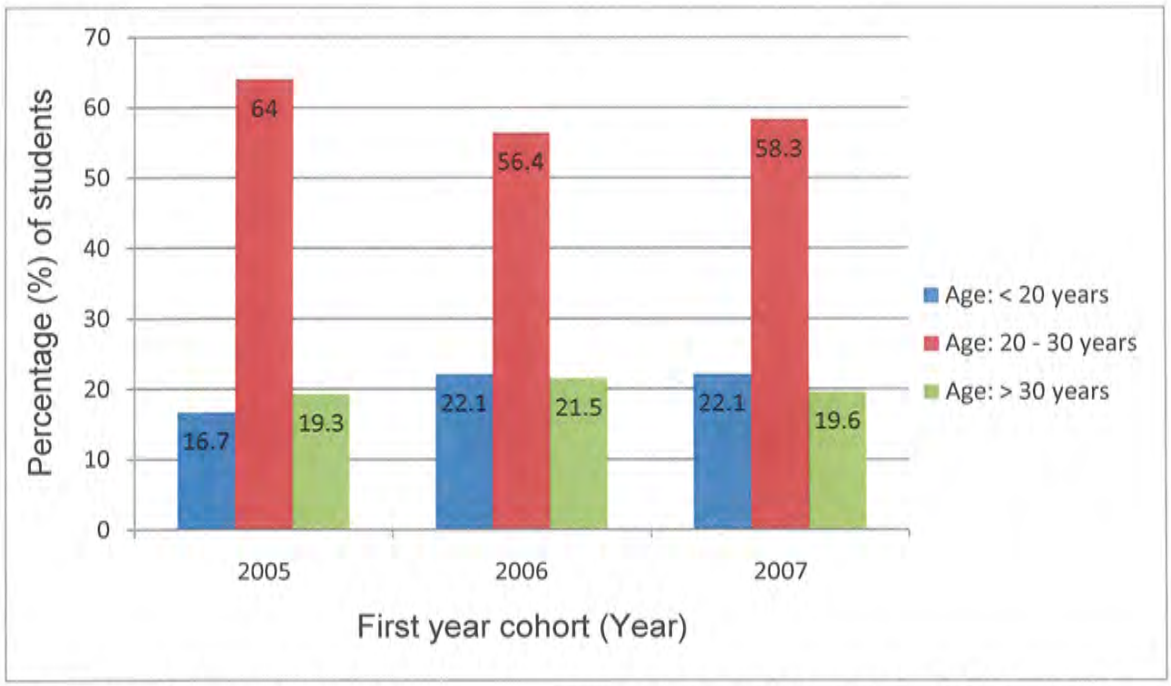


Figure 4.1: Ages of three first year nursing cohorts (male and female respondents from 2005-2007 cohorts)

There was not much variation in student age distribution between the three first year cohorts. Amongst the students commencing the pre-registration nursing course, the proportion of school-leavers remained consistently low at approximately 20%. First year students in the 20 to 30 year age group constituted 60%, and the remaining 20% were older than 30 years. The 20-30 years age bracket represents an important stage in life which includes establishing a stable

source of income through a viable career, perhaps settling down with a partner and/or raising a family, as well as enjoying a full social life. Nursing students in the senior age group, having had previous occupations, included people such as a senior mathematics teacher from a secondary school, an enrolled nurse with 20 years clinical work experience, and a Hospital Porter (information derived from focus groups).

In order to compare and statistically test whether the respondent sample of first year students was representative of the enrolled students in cohort, the data was collapsed to two categories "school-leavers" (< 20 years) and "mature-aged" (> 20 years). The age distribution of the three first year samples (survey respondents of a Year 1 science unit) was statistically similar to that of the total number of students enrolled in that Year 1 science unit – Table 4.6.

Table 4.6: Combined data of first year cohorts (2005-2007) showing comparison of age distribution in enrolled and respondent samples

Age profile of respondents	Enrolled sample % (n)	Respondent sample % (n)	χ^2	df	p
School-leavers	**20.1** (220)	**20.5** (105)	0.0273	1	>0.05
Mature-aged	**79.9** (872)	**79.5** (407)			NS

NS = non-significant difference

Table 4.7 shows that there were few male and female high school-leavers (15.2% - 16.7% of male respondents and 16.7% - 23.5% of female respondents were school-leavers) entering nursing, with the majority of the beginning students being mature-aged. These findings are in accordance with those reported in the literature (Boelen & Kenny 2009; Kilpatrick et al. 2007; AIHW 2009, 2003; Fleming & McKee 2005).

Table 4.7: First year nursing cohort participants by age

Age of Participants	2005 % (n)	2006 % (n)	2007 % (n)
Male students			
> 30	**38.9** (7)	**17.4** (4)	**21.2** (7)
20-30	**44.4** (8)	**60.9** (14)	**63.6** (21)
< 20	**16.7** (3)	**21.7** (5)	**15.2** (5)
Female students			
> 30	**16.7** (22)	**22.1** (31)	**19.3** (32)
20-30	**66.6** (88)	**55.8** (78)	**57.2** (95)
< 20	**16.7** (22)	**22.1** (31)	**23.5** (39)

The 20-30 year age group had the greatest representation (up to 66.6%). Compared to school-leavers, students in the 20-30 years age group are likely to be more ambitious or committed to a stable nursing career and income. However, upon graduating they have a shorter working career than school-leavers (Drury et al. 2009; Kilpatrick et al. 2007; Erickson & Grove 2007; Caron 2004). This influx of mature-aged and/or overseas-born students contributes to the increased numbers of males in nursing courses (Drury et al. 2009; Stott 2007). The need to attract more young people has become critical in order to ensure that nursing has a sustainable future. Graduating a high percentage of mature-aged students is making a significant contribution to nursing, however, the projected nursing shortage in 2020 remains (Drury et al. 2009). Difficulties encountered by mature-aged male students relate to various factors, including relationship, financial difficulties, having children and childcare (Steele et al. 2005).

4.3.2 Summary of age profile of second and third year students

Compared to the first year cohorts, the age profile of second year cohorts is slightly different, with higher numbers of older students (Figure 4.2).

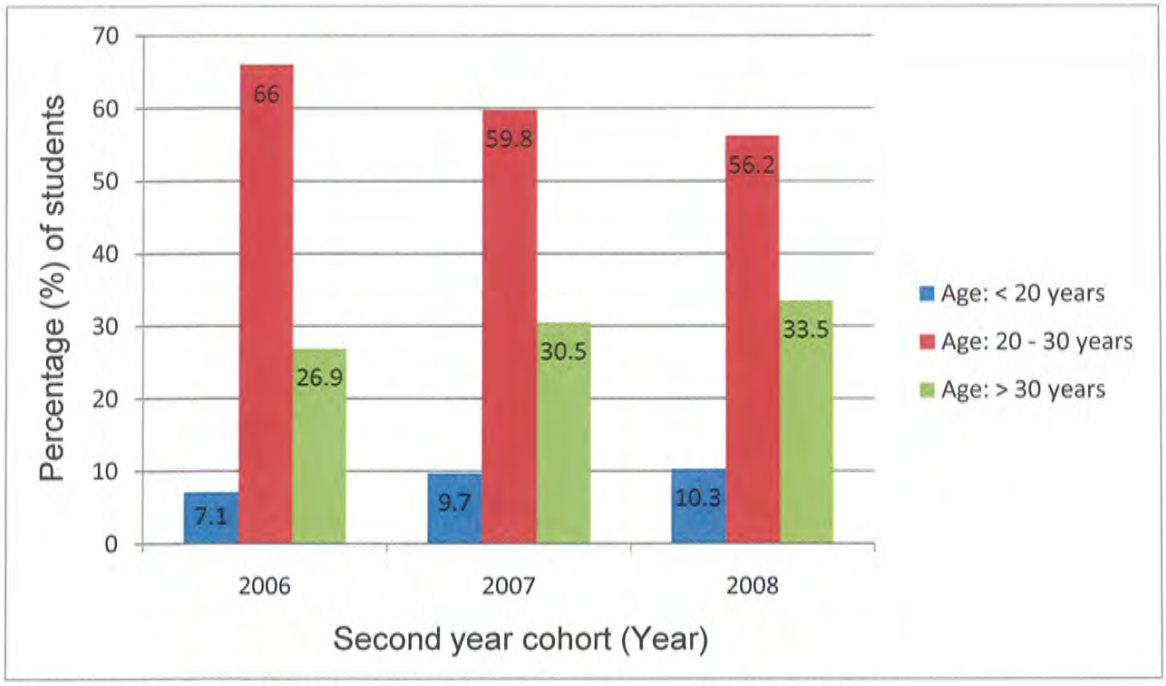


Figure 4.2: Ages of three second year nursing cohorts (2006-2008)

Figure 4.2 shows that the majority of second year nursing student respondents were in the age group 20 to 30 years. This is related to the fact that 50-70 students with Enrolled Nurse qualifications are admitted to the second year of the BN program.

In the three final year BN cohorts, there were more 20-30 years old students than those over 30 years – Figure 4.3. The student age profile of the three third year cohorts in this study did not vary much. It is noteworthy that nursing, in present economic climate, is offering study and work opportunities to students in a wide age range.

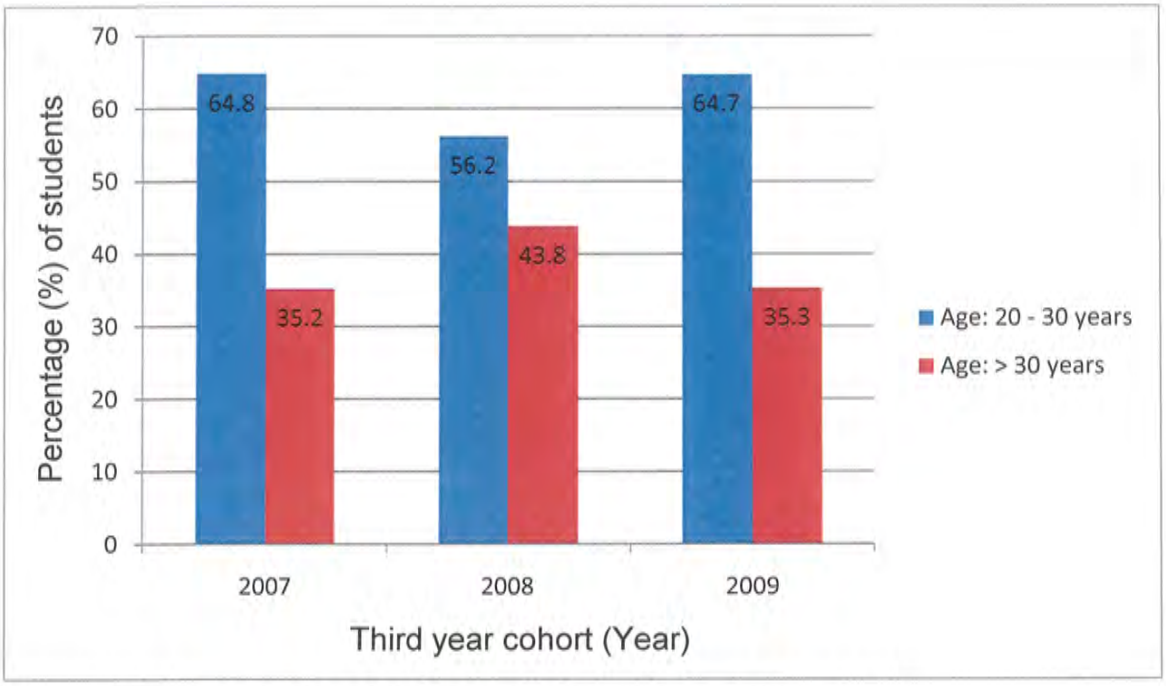


Figure 4.3: Ages of three third year nursing cohorts (2007-2009)

In the past decades, in Ireland and several other countries, a decline in university enrolments despite increasing demand for trained personnel had led to entry of more mature-aged students in all academic areas including nursing (Fleming & McKee 2005). Mature-aged students return to study for many reasons including choosing a second career, "second chancers" (students who did not have the opportunity to enter university as school-leavers or when young), employment opportunities, and availability of courses within their home areas (Boughn 2001). The changing economy may also contribute to an increase in mature-aged enrolment. According to Ryan (2001), the combination of flexible university access, recognition of prior learning, and an increase in mixed-mode delivery (i.e. a combination of on-campus, off-campus, and online delivery of course content have also contributed to an increase in mature-aged enrolment.

Mature nursing students experience many difficulties during their undergraduate training; their problems include childcare, time management, relationship and financial difficulties (Steele et al. 2005). According to Montgomery et al. (2009), supporting mature-aged nursing students in their study is desirable as they tend to perform better academically and bring a wealth of caring experience to the course.

4.4 Country of birth, residency and first language of students in study

4.4.1 First year cohorts: Country of birth and first language spoken

In the three first year cohorts (2005 to 2007), approximately 18% - 43% of male students were Australian-born, and 21% - 37% spoke English as their first language. During this period, approximately 24% - 28% of female students were Australian-born, and 30% - 41% spoke English as their first language - Tables 4.8. There were significant increases in the numbers of overseas-born male nursing students and overseas-born male and female students having English as a second language.

Table 4.8: Summary of first year nursing students' country of birth and first language spoken

Country of Birth	**2005 % (n)**		**2006 % (n)**		**2007 % (n)**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Australia	**42.9** (6)	**23.5** (31)	**26.1** (6)	**27.9** (39)	**18.2** (6)	**23.6** (39)
Other	**57.1** (8)	**82.6** (101)	**73.9** (17)	**72.1** (101)	**81.8**†(27)	**76.4** (126)
First Language						
English	**36.8** (7)	**36.2** (46)	**34.8** (8)	**40.7** (57)	**21.2** (7)	**29.9** (49)
Other	**63.2** (12)	**63.8** (81)	**65.2** (15)	**59.3** (83)	**78.8***(26)	**70.1**‡(115)

† $\chi^2 = 10.314$, df = 1, $p < 0.01$ (Country of birth, male data, 2007 versus 2005)
* $\chi^2 = 5.158$, df = 1, $p<0.05$ (First language, male data, 2007 versus 2005)
‡ $\chi^2 = 5.898$, df = 1, $p<0.05$ (First language, female data, 2007 versus 2005)

Amongst the 20% of school-leavers in the first year cohorts (Table 4.6), most were Australian-born students – see Table 4.9. Of the 150 students who returned completed questionnaires in 2005, 25 were in the age group less than 20 years of age. Of these 25 school-leavers, there were 3 male and 22 female students. None of the 3 males was Australian-born, while 17 of the 22 females were Australian-born. This suggests that the majority of young Australian-born students who commence nursing studies are female students, and that more young male school-leavers need to be attracted to the nursing profession.

Table 4.9: Numbers of Australian-born and overseas-born school-leavers in the three first year cohorts

Year 1 cohorts	2005	2006	2007
Respondents (N)	150	163	200
Students <20 (n)	25	36	44
Males (n)	3	5	5
Females (n)	22	31	39
Australian-born males (n)	0	2	2
Australian-born females (n)	17	16	22
Overseas-born males (n)	3	3	3
Overseas-born females (n)	0	15	17

This study shows that relatively few Australian-born high school-leavers are attracted to nursing as compared to mature-aged and overseas-born students with English as second language. In the first year cohorts, the numbers of school-leavers speaking English as their first language were: 76% (19) in the 2005 cohort, 61.1% (22) in the 2006 cohort, and 61.4% (27) in the 2007 cohort. A good command of English language, both spoken and written, and well developed communication skills is essential for all nursing students, not only in their learning of science, but also in nursing practice.

4.4.2 Summary of demographic data of all student cohorts in study

Data relating to country of origin, residency and first language of all participating nursing students in cohorts of Years 1, 2 and 3 in this study (note: combined data of male and female students, inclusive of various age groups) is presented in Table 4.10. Throughout the period of this study, the nursing student population at ACU (NSW) was diverse. Approximately a quarter were Australian-born and three-quarters overseas-born, half (this is probably an overestimation due to confusing data provided by some students – see above) were residents of Australia and the other half were citizens of between 48 to 65 countries. Approximately, one-third of the students spoke English as their first language and the remaining two-thirds came from various (approximately 50) linguistic backgrounds. It is of concern that approximately two-thirds of the nursing students are from backgrounds that do not include English.

Table 4.10: Summary of students' country of origin, residency and first language

	Group A % (n)	Group B % (n)	Group C % (n)
Year 1	2005	2006	2007
Origin			
Australia	**25.3** (37)	**27.6** (45)	**22.7** (45)
Other	**74.7** (109)	**72.4** (118)	**77.3** (153)
Residency			
Australia	**55.5** (75)	**64.4** (105)	**66.5** (121)
Other	**44.5** (60)	**35.6** (58)	**33.5** (61)
First language			
English	**36.3** (53)	**39.9** (65)	**28.4** (56)
Other	**63.7** (93)	**60.1** (98)	**71.6** (141)
Year 2	2006	2007	2008
Origin			
Australian	**37.7** (58)	**24.8** (38)	**28.5** (41)
Overseas	**62.3** (96)	**75.2** (115)	**71.5** (103)
Residency			
Australian	**67.3** (101)	**57.8** (89)	**70.8** (97)
Overseas	**32.7** (49)	**42.2** (65)	**29.2** (40)
First language			
English	**44.4** (68)	**33.8** (51)	**31.2** (45)
Other	**55.6** (85)	**66.2** (100)	**68.8** (99)
Year 3	2007	2008	2009
Origin			
Australian	**27.6** (40)	**20.8** (30)	**23.7** (41)
Overseas	**72.4** (105)	**79.2** (114)	**76.3** (132)
Residency			
Australian	**71.2** (99)	**65.9** (89)	**74.5** (117)
Overseas	**28.8** (40)	**34.1** (46)	**25.5** (40)
First language			
English	**32.2** (46)	**29.2** (42)	**27.9** (48)
Other	**67.8** (97)	**70.8** (102)	**72.1** (124)

The data on residency is possibly misleading as some international students may have misunderstood the question and ticked Australian Residency simply because they were living in Australia. Approximately, 25% of the first year cohorts were Australian-born, 33% used English as their first language and 67% were CALD students with varying proficiency in English. Up to 55% of the CALD students held Student Visas, and were full fee-paying international students (according to data obtained from University Statistics).

Australia offers internationally recognised courses and qualifications in various disciplines ranging from arts, business, engineering, information technology, law, medicine, nursing and science. The Australian BN degree is attractive to many international students as the qualification is recognised internationally, and it also confers the eligibility to apply for Australian Residency.

Between 2004 and 2007, large proportions of Australian nursing cohorts were composed of overseas students. During 2006 and 2007, 50% to 55% of all students enrolled in undergraduate nursing at ACU (NSW) were international students. The percentage of international students increased steadily by 20% between 2004 and 2007 at the North Sydney campus (Wright & Gollan 2008). Furthermore, in 2004, international students came to study at ACU (NSW) from 48 different countries around the world; and, in 2007, students came from 62 home countries. Therefore, ACU (NSW) became increasingly multicultural over the period of this study. According to data obtained for 2005-2007 from University Statistics, the highest representation of international students in the first year nursing cohorts was from Asian countries; the top five nations being China (38.5%, n = 645), South Korea (19.4%, n = 325), Nepal (7.6%, n = 128), Japan (7.6%, n = 127), and Philippines (6.1%, n = 103). Small numbers were from European or English-speaking countries. The Bachelor of Business (BBus) is another popular course at ACU (NSW) that attracts many international students from Asia and other continents. The top 5 countries from which most international BBus students came were China (15.4%, n = 66), Bangladesh (12.4%, n = 53), Nepal (10.0%, n = 43), Indonesia (5.6%, n = 24), and India (5.4%, n = 23). The three most common countries of origin of international students studying BN or BBus (during 2005-2007) at ACU (NSW) were China, South Korea and Nepal. This indicates that students from such countries highly value tertiary qualification, work experience and, possibly, the lifestyle in Australia. Compared to the undergraduate business course, there were approximately four times as many international students in the undergraduate nursing course and generally a lower representation of students from European countries.

In 2004, Australia was the fifth largest destination for overseas students, attracting 6% of all tertiary students enrolled outside their country of residence (Organisation

for Economic Co-operation & Development 2006). Full fee-paying overseas students are an important revenue source for Australian universities, and the provision of education services to international students has emerged as an important industry for the Australian economy. Revenue from three hundred and seventy-five thousand full fee-paying students in 2005 represented 15% of all revenue within the higher education sector (ABS 2007; DEST 2005).

For admission to the BN course at ACU, international applicants required the equivalent of Australian High School completion and an academic International English Language Testing System (IELTS) score of 6.5 with a minimum of 6.0 in all bands (The IELTS score ranges from 1 to 9). ACU offers many flexible entry pathways for international students under the Diploma Pathways Programs, which are designed to meet their English and academic needs. An international student may pursue a Diploma Pathway Program to develop his/her skills for making the transition into the undergraduate nursing program.

4.5 Living arrangement and family commitments of students in study

4.5.1 Students' family and living arrangement

Nursing students' family and living arrangement information for three successive first, second and third year cohorts is presented in Table 4.11.

Table 4.11: Summary of nursing students' family and living arrangement

	Group A % (n)	Group B % (n)	Group C % (n)
Year 1	2005	2006	2007
Accommodation			
Living alone	**18.0** (27)	**12.3** (20)	**14.5** (28)
With spouse/partner	**30.0** (45)	**21.0** (34)	**25.4** (49)
With friend(s)	**23.3** (35)	**31.5** (51)	**22.3** (43)
With parents	**27.4** (41)	**32.7** (53)	**36.3**†(70)
Other *	**1.3** (2)	**2.5** (4)	**1.5** (3)
Children			
No children	**87.7** (121)	**85.6** (137)	**85.3** (163)
1 child	**8.7** (12)	**6.9** (11)	**7.3** (14)
2 or more children	**3.6** (5)	**7.5** (12)	**7.3** (14)
Year 2	2006	2007	2008
Accommodation			
Living alone	**11.0** (17)	**13.3** (20)	**18.7** (27)
With spouse/partner	**31.2** (48)	**29.8** (45)	**29.2** (42)
With friend(s)	**24.0** (37)	**22.5** (34)	**24.3** (35)
With parents	**33.1** (51)	**29.8** (45)	**25.7** (37)
Other	**0.7** (1)	**4.6** (7)	**2.1** (3)
Children			
No children	**73.6** (109)	**78.6** (114)	**78.2** (111)
1 child	**12.2** (18)	**9.7** (14)	**9.8** (14)
2 or more children	**14.2** (21)	**11.7** (17)	**12.0** (17)
Year 3	2007	2008	2009
Accommodation			
Living alone	**11.0** (16)	**15.8** (23)	**11.9** (20)
With spouse/partner	**34.9** (51)	**32.2** (47)	**31.0** (52)
With friend(s)	**19.2** (28)	**29.4** (43)	**23.2** (39)
With parents	**31.5** (46)	**21.2** (31)	**31.0** (52)
Other	**3.4** (5)	**1.4** (2)	**2.9** (5)
Children			
No children	**71.6** (96)	**70.7** (99)	**72.8** (123)
1 child	**15.7** (21)	**13.6** (19)	**13.0** (22)
2 or more children	**12.7** (17)	**15.7** (22)	**14.2** (24)

* Other accommodation arrangements include living with relatives or as a single parent with child/children. † $\chi^2 = 7.577$, df = 1, p = 0.006

Many more nursing students lived with either a spouse/partner or parents than with friends or alone, and approximately 30% supported one or more children. Between the period 2005 and 2007, the first year cohorts showed an increase from 27% to 36% in students living in parental homes ($\chi^2 = 7.577$, df = 1, p = 0.006). This was probably indicative of the soaring cost of rental accommodation

in Sydney, as Government taxes and charges restricted supply of properties and artificially inflated rents (Realestate 2006). During the same time period, approximately 25% lived in shared accommodation with friends. Of the first year male students, 55.6% lived with a partner or parents, and the remainder lived alone or with friends. Of the first year female students, 62.5% lived with a partner or parents and the remainder lived alone or with friends.

The second year cohorts showed an increasing trend of living alone (11.0% to 18.7%; χ^2 = 2.273, df = 1, p = 0.132) during 2006 to 2008, and therefore a decreasing trend of those living with parents (33.1% to 25.7%; χ^2 = 2.436, df = 1, p = 0.296), although these trends were not statistically significant.

Although most third year students lived with spouse/partner or in parental homes during 2007 to 2009, there were no clear trends in other living arrangements such as shared accommodation. The advantage of shared student accommodation is two-fold: it may help to reduce living expenses as well as strengthen social and academic skills. The disadvantage would be if ESL students only speak their mother tongue when together and do not immerse themselves in the English language.

4.5.2 Family commitments of students in study (2005-2009)

As the survey response rates for cohorts varied, it was considered necessary to combine data to obtain an overview of nursing students' family commitments. Cumulative data of the three cohorts of students for each year of study are shown in Table 4.12, with comparison of the proportions of students having children.

Table 4.12: Comparison of three cohorts each of first, second and third year nursing students, showing proportions of students with children

Students with dependent children	Three Yr 1 cohorts **%** (n)	Three Year 2 cohorts **%** (n)	Three Year 3 cohorts **%** (n)
No children	**86.1** (421)	**76.8** (434)	**71.8** (318)
One or more	**13.9** (68)	**23.2** (101)	**28.2** (125) †

† χ^2 = 16.834, df = 1, p < 0.0001 - Significant increase in percentage of students with children, Year 3 cohorts versus Year 1 cohorts.
(Year 1 cohorts: 2005, 2006, 2007), (Year 2 cohorts: 2006, 2007, 2008),
(Year 3 cohorts: 2007, 2008, 2009).

This table shows that nursing students generally had increasing commitments to their family, in particular there was a significant difference ($\chi^2 = 16.834$, df = 1, $p < 0.0001$) in the proportion of students having children between first and third year students, while students having no children decreased (from 86.1% in Year 1 to 71.8% in Year 3). Of the students having one or more children, the proportion of mature-aged female students with dependent children was significantly higher than the proportion of male students - for instance, of the third year student respondents having one or more children, 88.0% were females and only 12 % were males ($\chi^2 = 254.8$, df = 1, $p < 0.0001$) Table 4.13. The students with children were 2 to 5 times more likely to be over 30 years old than those in the 20 to 30 years age group.

Table 4.13: Comparison of nursing students having one or more children, by gender and by age

	Year 1 % (n)	Year 2 % (n)	Year 3 % (n)
Gender			
Male	**14.7** (10)	**14.9** (15)	**12.0** (15)
Female	**85.3** (58)	**85.1** (86)	**88.0** (110)*
Age			
<20 years	**4.4** (3)	**2.0** (2)	**0.0** (0)
20-30 years	**26.5** (18)	**18.8** (19)	**16.8** (21)
>30 years	**69.1** (47)	**79.2** (80)	**83.2** (104)

(Year 1 cohorts: 2005, 2006, 2007), (Year 2 cohorts: 2006, 2007, 2008), (Year 3 cohorts: 2007, 2008, 2009). * $\chi^2 = 254.8$, df = 1, $p < 0.0001$

Nursing students having dependent children generally lived with a spouse or partner and were working between 15 to 35 hours per week (see section 4.5.3). Therefore, in addition to the pressures of study, these students had additional commitments such as arranging childcare, including picking/dropping off child/children from childcare or school, cooking for the family, and other household duties.

Female students living with family mainly complained of time constraints owing to domestic responsibilities. Two students were particularly poignant in talking about this problem:

"It is extremely stressful with family... after uni, cooking, and cleaning, I get to sit down to study but I feel tired and sleepy because it's already past 9.30 at night." (Third year student, focus group discussion transcript).

"As a mature-aged student with 2 children, I just don't have enough study time even though I don't work. My husband provides the income but he is also a student. Even writing the assignments take long, then I run out of time to revise or prepare for exams." (Taken from one-to-one interview notes).

One female student had specific responsibilities that demanded much of her time:

"I live with and provide care for my elderly mum. The domestic chores and working part-time cut into my study time". (Taken from first year focus group transcript).

Another female student reported:

"It's very hard because my young sister and parents in Vietnam depend on me. It's for them that I keep on going...I need to continue to work and study. At times, I have to go to work and miss classes. I don't want to miss classes but I have to." (Second year student, one-to-one interview notes).

First year male nursing students with dependent families commonly cited financial worries as a main barrier for study. Sample comments are given below:

"I migrated to Australia just a couple of years ago. Having not much luck with my first two jobs here, I decided to enroll in BN. It's getting harder to support my family even though I work part-time. My wife is looking for part-time or casual work while she looks after our 2 kids." (Taken from one-to-one interview).

"I don't have many of the difficulties that [pointing to 2 overseas students] *overseas students have, but I'm a single parent, so I must work to make ends meet. Work and domestic commitments leave me very little time for study. I have been out of job many times before, so I have to give equal priority to work and nursing study."* (Taken from first year focus group transcript).

One Australian male student wrote:

"I work 37.5 hours per week to support my wife and 2 kids, but there's not enough hours in the day to combine study, work and social life – it's hard to get family to be understanding." (First year student, free-text response in questionnaire).

Nursing students from CALD backgrounds experienced the pressures of learning in English as a second language and conflicting priorities as they juggled study, work, domestic and social obligations. This pressure is exacerbated for men

because of traditional expectations that the mature male be the "bread-winner" in the family in many cultures (Mehta & Robinson 2010).

These findings are of concern because preregistration nursing students do experience stress and burnout (Deary et al. 2003). Family commitments have been a major factor contributing to student attrition in the Australia, United Kingdom and USA (Salamonson et al. 2008; Rudel 2006).

4.5.3 Employment practices of BN students

4.5.3.1 First year nursing students' employment practices

Most (66.7% to 100%) responding males were engaged in paid employment. Between 30.0% and 36.4% of males and 41.4% to 43.2% of females worked in excess of 15 hours per week (Table 4.14).

Table 4.14: Students engaged in paid employment

Work hours	2005 % (n)	2006 % (n)	2007 % (n)
Males			
0 h/wk	-	-	**33.3 (11)**
1 - 14 h/wk	-	**70.0 (14)**	**30.3 (10)**
15-35 h/wk	-	**30.0 (6)**	**36.4 (12)**
Females			
0 h/wk	-	**13.6 (16)**	**23.2 (38)**
1 - 14 h/wk	-	**43.2 (51)**	**35.4 (58)**
15-35 h/wk	-	**43.2 (51)**	**41.4 (68)**

- Data not available

Employment practices of first year cohorts (2006 and 2007) were further analysed to explore whether school-leavers (younger than 20 years) or mature-aged (over 20 years of age) students were working longer (15-35 hours) hours per week. The results (Table 4.15) show that a significantly higher proportion of mature-aged male students were working 15 to 35 hours per week than male school-leavers. Many school-leavers were still receiving parental support and, thus, possibly did

not need to work as much, whereas mature-aged students needed to work more hours to support themselves and their families.

Table 4.15: Comparison of hours worked by male students: school-leavers versus mature-aged students

Work hours	2006 % (n)	2007 % (n)
School-leavers		
0 h/wk	**10.3** (3)	**36.4** (16)
1 - 14 h/wk	**51.7** (15)	**34.1** (15)
15-35 h/wk	**38.0** (11)	**29.5** (13)
Mature-aged students		
0 h/wk	**11.9** (13)	**21.6** (33)
1 - 14 h/wk	**45.9** (50)	**34.0** (52)
15-35 h/wk	**42.2** (46)†	**44.4** (68)‡

† 2006 cohort: significantly higher proportion of mature-aged students than school-leavers worked 15-35 h/wk (χ^2=21.491, df =1, p < 0.001);
‡ 2007 cohort: significantly higher proportion of mature-aged students than school-leavers worked 15-35 h/wk (χ^2=37.346, df =1, p < 0.001).

Of the first year mature-aged students (2006 and 2007 cohorts) engaged in paid employment, a significantly higher proportion of females worked 15 to 35 hours per week (Table 4.16), possibly because it was easier for women to find work in healthcare settings.

Table 4.16: Comparison of working hours of first year mature-aged students

Work hours	2006 % (n)	2007 % (n)
Males (>20 years)		
1-14 h/wk	**75.0** (12)	**47.6** (10)
15-35 h/wk	**25.0** (4)	**52.4** (11)
Females (>20 years)		
1-14 h/wk	**48.1** (38)	**43.0** (43)
15-35 h/wk	**51.9** (41)†	**57.0** (57)‡

† 2006 cohort: significantly higher proportion of mature-aged female students than males worked 15-35 h/wk (χ^2=30.422, df =1, p < 0.001);
‡ 2007 cohort: significantly higher proportion of mature-aged female students than males worked 15-35 h/wk (χ^2=31.118, df =1, p < 0.001).

Tertiary male and female students working for pay are likely to experience stress in managing various commitments and obligations that demand much effort and time.

4.5.3.2 Summary of employment practices of students in Years 1, 2 and 3

Information on nursing students' employment practices of Years 1, 2 and 3 (combined data of male and female students) is shown in Table 4.17.

Table 4.17: Nursing students' balancing of study and work

	Cohort 1 % (n)	Cohort 2 % (n)	Cohort 3 % (n)
Year 1	2005	2006	2007
Students in paid employment			
15-35 (hrs)	#	**47.1** (65)	**41.1** (81)
1-14 (hrs)	#	**41.3** (57)	**34.0** (67)
0 (hrs)	#	**11.6** (16)	**24.9** (49)
Difficulty balancing study and work			
Yes	**65.0** (91)	**60.0** (93)	**66.3** (132)
No	**35.0** (49)	**40.0** (62)	**33.7** (67)
Year 2	2006	2007	2008
Students in paid employment			
15-35 (hrs)	**51.0** (74)	**55.2** (84)	**60.7** (85)
1-14 (hrs)	**44.2** (64)	**34.9** (53)	**27.9** (39)
0 (hrs)	**4.8** (7)	**9.9** (15)	**11.4** (16)
Difficulty balancing study and work			
Yes	**63.8** (95)	**67.5** (102)	**68.8** (97)
No	**36.2** (54)	**32.5** (49)	**31.2** (44)
Year 3	2007	2008	2009
Students in paid employment			
15-35 (hrs)	**60.6** (86)	**61.9** (86)	**58.4** (97)
1-14 (hrs)	**28.9** (41)	**28.0** (39)	**28.9** (48)
0 (hrs)	**10.5** (15)	**10.1** (14)	**12.7** (21)
Difficulty balancing study and work			
Yes	**65.5** (95)	**73.1** (106)	**68.8** (117)
No	**34.5** (50)	**26.9** (39)	**31.2** (53)

data not available

The students' hours in paid employment were similar between cohorts of the same year. The majority (more than 75%) of nursing students across all years of the nursing course was working for pay, and experienced difficulty balancing study and work. While students' work has the potential to impact adversely upon their learning experience, working in a health-related area may be beneficial (Pike et al. 2008). Conversely excessive hours of work in either a health-related area or non-health-related may cut into study time and hinder learning. Between 60% and 66% of first year students reported difficulties in balancing study and work. Although not statistically significant, there was an increasing trend in the percentage of

second year students in paid work (in excess of 15 hours per week) which probably led to a struggle to balance study and work.

Table 4.18 shows that over the duration of their undergraduate degree, both male and female nursing students progressively and significantly increased the hours working for pay.

Table 4.18: Comparison of male and female nursing students' hours in paid employment

Year / Gender	Students working 1-14 h/wk % (n)	Students working 15-35 h/wk % (n)
Yr 1 Males	**56.1** (23)	**43.9** (18)
Yr 1 Females	**48.0** (109)	**52.0** (118)
Yr 2 Males	**35.3** (24)	**64.7**† (44)
Yr 2 Females	**39.1** (132)	**58.9** (199)
Yr 3 Males	**27.0** (17)	**73.0** (46)
Yr 3 Females	**31.5** (102)	**68.5** (222)

† Significant increase in Yr 2 male students working 15-35 h/wk ($\chi^2 = 10.903$, df = 1, p = 0.001)
† Significant increase in Yr 2 female students working 15-35 h/wk ($\chi^2 = 20.697$, df = 1, p < 0.001)

The percentage of second year male students working 15-35 hours per week was significantly greater than that of the first year male students ($\chi^2 = 10.903$, df = 1, p = 0.001). Similarly, the percentage of second year female students working 15-35 hours per week was significantly greater than that of the first year female students ($\chi^2 = 20.697$, df = 1, p < 0.001). Comparison of second and third year percentages for both genders showed further increasing trends in students working long hours (15 to 35 hours per week), mostly in health-related work as Assistants in Nursing (AIN = Assistant in Nursing).

4.5.3.3 Impacts of paid work on nursing study

The Australian National Review of Nursing Education (2002) advocated that nursing students be encouraged to engage in part-time work as Assistants in Nursing during their undergraduate studies. This was recommended as a strategy to increase students' clinical experience (Australian National Nursing Education

Review 2002). In a brief study conducted during lecture time at ACU (NSW) where attending students were requested to respond by show of hands it was found that, of the nursing students (in Years 1, 2 and 3) engaged in paid employment, between 60% and 80% were working in a healthcare-related discipline. Many of the students working as an AIN felt that as they progressed through the BN course, they became better equipped to work in a healthcare environment (data derived from discussions with students). Work experience as an AIN (as opposed to other general work) benefitted the nursing students in acquiring a range of responsibilities and practical skills, including interpersonal liaison with clients in the healthcare environment, negotiation, conflict resolution, organisational ability, and time management (data from one-to-one interviews and focus group discussions). In addition to exposure to English language and acquiring communication skills, students from CALD backgrounds learnt about ethical practice. This supports the findings of Salamonson & Andrew (2006), who reported that part-time employment in nursing-related occupations was beneficial to nursing students. Part-time, nursing-related work experience may assist students by broadening and consolidating their nursing clinical experience (Lee et al. 1999) in addition to helping them meet their financial needs. Paid employment can provide many attributes and skills required in nursing such as being self-aware, ability of lifelong learning, management and leadership, and conflict resolution (Krause et al. 2005; Jones & Cheek 2003). Although beyond the scope of the present project, a detailed investigation of how part-time, nursing-related employment impacts on students' academic performance in undergraduate nursing programs would be useful.

Some nursing students stated that the amount of effort required in studies was much higher than what they had expected. Between 60% and 73% of the students (in Years 1, 2 and 3) reported difficulty managing study and work obligations (Table 4.14), and 41% - 62% stated that they were in paid work for more than 15 hours per week. Common student experiences are exemplified by their statements such as:

"I need to work to be able to support myself but work cuts into my study time. The study load is huge and there's not enough time to understand and remember all the content."

"I find it difficult to prioritise... I believe that good time management skills would be very useful."

With the rising cost of living (including payment of university fees, accommodation and other living expenses), many students needed to work to support themselves during their undergraduate years. These students were confronted with conflicting priorities between university studies, paid employment and social life. Mature-aged students generally experienced added pressures of having to balance family obligations, work and study while adapting into student life.

While paid employment is a basic necessity for some students in higher education, working excessive hours (more than 16 hours per week) is stressful and jeopardises successful transition to university studies and academic performance (Pike et al. 2008; Krause et al. 2005, page 56). Inconsistent findings have been reported regarding the relationship between working for pay and grade (academic achievement) – one possible explanation is that the relationship between work and grades is not linear (Pike et al. 2008). Pike and co-workers (2008) found a statistically negative relationship between working more than 20 hours per week and grades (weaker engagement in study and attachment to university). Working 20 hours or less was positively (and significantly) related to grades, acting through student engagement (greater level of participation in active and collaborative learning and positive interactions between students and faculty members).

4.6 Previous science education

Combined data from the three first year cohorts (2005 to 2007) showed that 17.0% (76 students) had previous science education at a tertiary level, 57.4% (256) had studied at least one science subject at a secondary level (Year 12 or equivalent). 25.6% (114) studied a science subject in Year 11 or below. However, between 38% and 43% of respondents who completed the question on previous science education stated that they had not studied science for a considerable

length of time (5 to 30 years), prior to commencing the BN course (Table 4.19). Of these students who had no science education within at least five years of starting the BN studies, the majority (88.1%) were female students. This finding supports that of other researchers (Gresty & Cotton 2003; Caon & Treagust 1993).

Table 4.19: First year respondents without science education in five or more years prior to commencing the BN course

2005 % (n)	2006 % (n)	2007 % (n)
42.7 (35) (2 males, 33 females)	**45.6** (47) (5 males, 42 females)	**37.9** (36) (7 males, 29 females)

Difference between cohorts was non-significant.

Some enrolled nurses stated that their clinical work experience directly related to their BN studies. Hence, students having previous science education are more likely to enjoy learning the subject and accept its relevance to nursing practice, whereas those having little or no science background are more likely to find it difficult and underestimate the importance and relevance of science to nursing. Having previous biological science knowledge has been found to positively influence performance in biological science (McKee 2002), yet a science background is seldom a prerequisite for admission in to a nursing course. According to the admission policy of Australian Catholic University, applicants for admission into the BN degree course only require the equivalent to Australian High School completion plus an academic IELTS 6.5 (with a minimum of 6.0 in all tests). There are no subject pre-requisites. Student nurses as a group are different from other groups of students who enrol in a science course at any Australian tertiary institution in that the cohorts largely comprise female and mature-aged students many of whom, with little previous science education, returned to university studies after absences of five to thirty years (Drury et al. 2009; Gibson 2009; Montgomery et al. 2009).

Possible explanations for students finding science difficult include insufficient resources and time allocated to the teaching of science (Burke da Silva et al. 2008; McKee 2005; Jordan et al. 1999), student selection, teaching strategies and

curriculum design. Selection of students who were highly oriented to study or who had previous (preferably recent) science education or qualification would be desirable, although not feasible.

4.7 Nursing students' career choices, aspirations and expectations

4.7.1 Career choices of first year students

First year nursing students' reasons given for choosing nursing (questionnaire data) are summarised in Table 4.20.

Table 4.20: Stated career choices of first year nursing students

	2005 % (n)	2006 % (n)	2007 % (n)
First career choice			
Nursing	**62.3** (91)	**64.2** (102)	**61.0** (122)
Other	**37.7** (55)	**35.8** (57)	**39.0** (78)
Reasons for choosing nursing			
Employment opportunities and job security	**45.5** (163)	**39.7** (173)	**44.3** (232)
Reputation as specialised Profession	**24.9** (89)	**29.8** (130)	**27.0** (141)
Altruistic reasons	**22.3** (80)	**22.2** (97)	**19.7** (103)
Other	**7.3** (26)	**8.3** (36)	**9.0** (47)

More than 60% of commencing students stated that nursing was their first career choice. Students for whom nursing was not the first choice stated their preferred occupation, of which popular choices included health-related careers (such as medicine, dentistry, psychology, physiotherapy), as well as accounting, engineering, information technology, and teaching. Some students pursued a nursing career because they considered that it would provide a pathway to health-related careers such as medicine, paramedicine and physiotherapy. 28 students, mostly males, indicated that they were tempted by the prospect of travel and immigration as nursing is a portable career; a few (at least 4) international students also disclosed that they chose nursing to maximise their chances of gaining Australian residency. A few male and female students also stated that they intended to work in a not-for-profit organisation, or a non-commercial environment. In Australia, persistent areas of skill shortages in the past 20 years include the following professions: nursing, physiotherapy, pharmacy, occupational

therapy, accounting and some engineering specialisations (DEEWR 2008, page 22).

There was consistency amongst the three successive cohorts in that employment opportunities and job security were significant reasons for choosing a nursing career. Some first year students (2005 to 2007) gave additional, free-text responses to support their reasons for having chosen a nursing career. Analysis of these responses indicated that many students were enthusiastic about a nursing career. Many students chose nursing because "nursing is a profession (requiring expert knowledge and skills) which offers opportunities in caring for people", and because of the many opportunities for nursing specialism (e.g. paediatrics, midwifery, accident and emergency, critical care, palliative care, mental health, general surgical).

Apart from the attractions of nursing for career and stability motives, the cohorts investigated included students with caring and altruistic intentions who regarded the nursing profession as a meaningful way of contributing to human welfare. Additional reasons given for choosing nursing were grouped into three categories: "vocational", "drifted", and "influenced". The "vocational" reasons included student statements such as "I have a strong interest in clinical science" and "I always wanted to be a nurse". A few stated that they embraced nursing as an honest, spiritual occupation. Other typical statements include:

"I want to help children."

"I'm very passionate about helping people live a healthy life and want to [help] *make the world a better place."*

"I love nursing. I hope to become a good nurse."

"I want to work in a hospital."

Students who embarked upon nursing education due to altruistic intentions identified caring as the essence of nursing: "I wanted to do something meaningful for humanity". In defining nursing, students have used verbs: *"caring, nurturing, teaching and implementing"*. Some students also use nouns to describe their

perceptions of nursing: *"profession", "holistic system", "connecting system"* (Cook et al. 2003). The complexity of nursing, being both a "calling" and a science-based degree, presents a challenge for some students to merge the two components of altruism and scientific prowess.

The "drifted" reasons include comments such as "I did not get into medicine, nursing was my second choice" and "I came from an engineering background, which I found very tiring and boring". Some mature-aged students who changed their careers to nursing anticipated that the BN degree would lead to a stable income and restore a sense of direction and security in their lives. Eighteen students stated that they were "influenced by relatives" in their decision to pursue a nursing career. Some typical students' reasons, as stated in their own words are listed in Figure 4.4.

"Nursing will help me get visas."
"Easy to apply for Australian Residency."
"Nursing is a respected profession with opportunities for specialisation."
"Long term employment and in demand, not afraid of not having a job when older."
"Nursing is flexible and allows me time to pursue music."
"I want to improve awareness of primary healthcare in indigenous communities."
"I want to work in a hospital."
"I want to improve health of people in poorer countries."
"I want to help children."
"Influenced by relatives."
"Calling from God."
"I want to contribute to society in a meaningful way."
"As a child, I was cared for by nurses who were nice; growing up, I was looking for an interesting career as a woman."

Figure 4.4: Sample student reasons for choosing nursing

4.7.2 Male students' career interests

Although some male students had varied careers prior to commencing the BN, 42.1%-66.7% of the respondents (from three successive cohorts: 2005-2007) indicated that nursing was their first career choice – Figure 4.5. It was thus encouraging to see a significant increase in men entering nursing programs as a first career choice ($p = 0.011$, comparison of 2005 and 2007 first year cohorts).

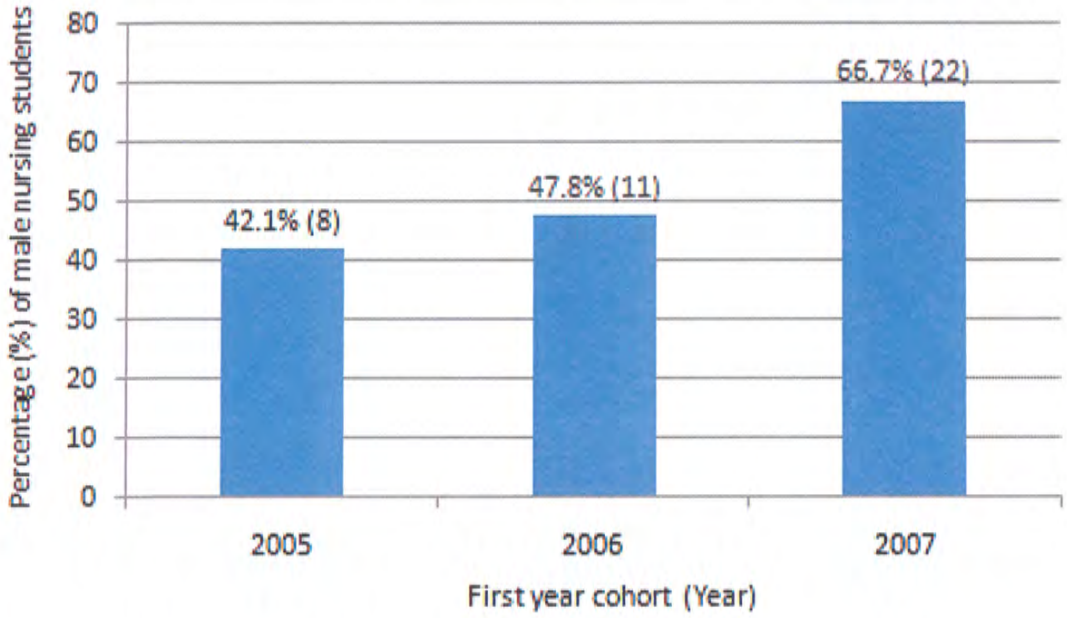


Figure 4.5: Percentage of first year male students stating nursing as their first career choice (ACU, NSW)

The main reported attractions of nursing for men were many employment opportunities, job security, altruism, and interest in clinical science - Figure 4.6. Some students disclosed that they were also attracted to nursing because it offered good prospects for travel and immigration (Mehta & Robinson 2008c).

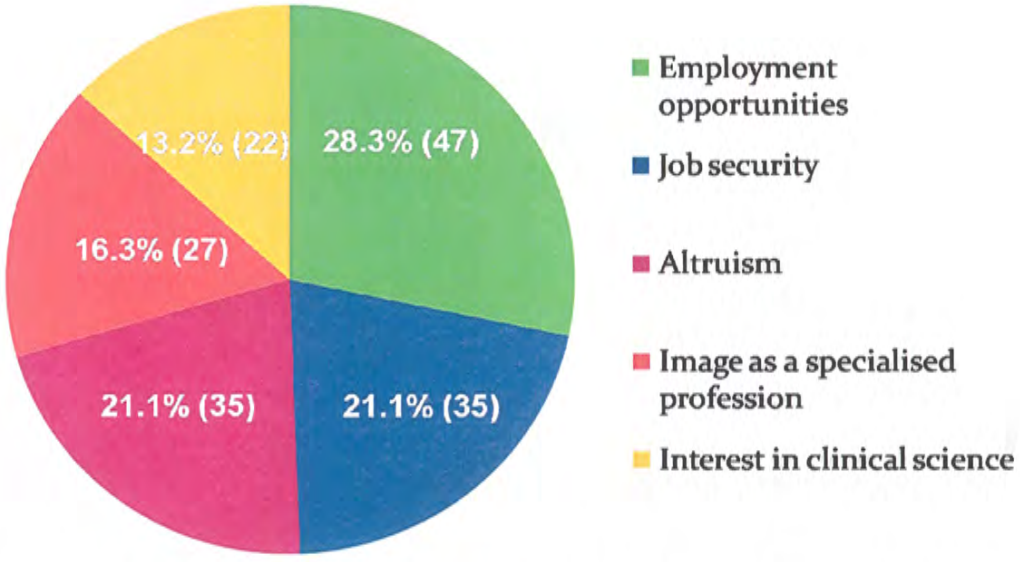


Figure 4.6: Male students' stated reasons for choosing nursing (2005-2007)

Amongst the students surveyed, perceived salary was not a significant factor in the decision to choose or reject nursing. This finding is consistent with that of Hemsley-Brown & Foskett (1999). As one first year male student expressed *"The income is not going to be great but some are called to serve the sick and help people... men have responded in the past and will continue to do so."* Crawford et al. (1998) described a link between the spiritual life and caring work (page 212). For a few male students a nursing career represented an opportunity for living a working life dedicated to higher ideals of compassion and love.

Many nursing students identified *caring* as the essence of nursing, and cited a desire to "help people". Grady et al. (2008) pointed out that the desire to help others is a requisite personality trait of a nurse, and that caring comes naturally for men who are interested in nursing. Caring in nursing involves thoughtfully responding to patients (O'Brien et al. 2008) as it is an interaction essential to the nurse-patient healing relationship (Grady et al. 2008). Mature-aged male and female students bring a wealth of caring experience to the nursing course (Montgomery et al. 2009).

David [not his real name], a third year male nursing student, admitted that *"at first, I took a systematic approach to nursing because I was task oriented, but subsequently found that there was more to nursing and that I had to work harder at caring. I have come to realise that it is the patient who determines the appropriateness of the touch of male nurses".*

According to Sally [name changed; third year student], *"women regard caring as something innate. I believe that the patient should have a choice of being cared for by a male or female nurse or both, therefore it is important to have both, male and female nurses in a clinical setting".*

Frank [a mature-aged student in Year 2] emphasised that: *"I just wanted to up-skill and move to an occupation that offered opportunities, flexibility and financial stability".* This is congruent with the view held by Biggs & Tang (2007) that "Young people are attracted to a career which offers variety, challenge, job flexibility and security" (Biggs & Tang 2007).

4.7.3 Career aspirations of male and female nursing students

Data from focus groups and from questionnaire item "what was your main reason for choosing a career in nursing?" were compared to determine career aspirations of nursing students. Focus group discussions with first and third year cohorts revealed that some female students indicated preferences for specialising in paediatrics, midwifery, general care and aged-care. Many male students aspired to work in high pressure speciality areas of nursing practice such as accident and emergency, critical care, and mental health, because they were *"motivated by challenge"* and because they realised the potential for *"leadership and career advancement"*. This is consistent with the following reports in literature. Men have traditionally been assumed to prefer scientific and technological work (Klief & Faulkner 2003). After graduating with BN, men that remain in clinical practice tend to prefer engaging in the technical aspects of nursing (Stott 2007). The speciality of critical care (see Photograph 4.2) attracts large numbers of men because of the technological focus (Clare et al. 2001; Williams 1995). There was an indication that women also tended to be attracted to leadership positions.

Photograph 4.2: A male nurse working in theatre
(Photograph supplied by student)

In nursing, the division of labour based on gender, has resulted in men working in high pressure areas of nursing that are considered more congruent with masculinity, such as emergency and critical care, and mental health (Evans 2004; Muldoon & Reilly 2003; Clare et al. 2001). As the top roles in nursing emphasise leadership, technical knowledge, physical strength, and dedication to work (Evans 1997; Williams 1995), men have advantages with respect to career promotion (cited in Harding 2008, page 48). Despite career advantages for men in nursing, as evidenced by their disproportionate representation in leadership positions (such as supervisor and director or assistant director of nursing), they have been limited in other areas of nursing such as obstetrics (Evans 2004, page 326).

Rossiter and Yam (1998) used an ethnographic approach to explore perceptions of nursing among the CALD high school students in Sydney. The secondary school students associated nursing with human well-being, and believed that nurses needed to possess good interpersonal and technical skills. Their negative perceptions of nursing included performing unpleasant tasks such as handling body fluids and wastes (therefore, high risk of infection), and handling uncontrollable behaviours of patients, visitors and healthcare workers (Rossiter & Yam 1998).

In Australia, the payment of tertiary fees and salary of a nursing graduate may influence school-leavers' decisions to consider nursing as a career. There is a general perception in the community that the cost of tertiary education is high. Furthermore, nursing graduate salary is low relative to other occupations. An Australian citizen commencing an undergraduate nursing program in the period 2005 - 2007 was required to pay the total Higher Education Contribution Scheme (HECS) fee of approximately $AUD 17,000 for his/her total university study (approximately $53,520 for international students). Upon graduation, the starting salary for a Registered nurse (in the same time period) was approximately $40,000 per annum, which was much less than graduate salaries in other disciplines such as teaching or policing ($50,000 per annum) (Drury et al. 2009). Furthermore, local, young (school-leavers) Australian students may be apprehensive about the fact that the "New Graduate Registered Nurse and

Registered Midwife Transition Recruitment" is competitive in large cities (NSW Health Department 2011).

Men are increasingly accepting nursing as a profession suitable for both genders as it offers good employment opportunities and job security. Interest in embarking on nursing may be related to the fact that the Australian BN degree is recognised internationally and that it qualifies nurses for Australian residency (DIAC 2011). One student expressed his motive for pursuing nursing studies:

> *"In my country, public still see nursing as women's work, but I didn't care about what people will think. A few friends had come to Australia to study nursing, they found a job and were able to settle here for a better life, so I decided to give it a go."*

Some male students felt the need to justify their career choices. In first year focus groups, male students stated:

> *"People still ask me: Why Nursing? or Are you going to continue study to become a doctor? I'd say to them: I'm committed to nursing only because it adds purpose and meaning to my life…many opportunities and great rewards."*
>
> *"I used to be concerned that people think it* [nursing] *is women's work but I can now see that what most male nurses do is exciting and rewarding."*
>
> *"I'm glad* [that] *I made the right career choice after all! Nursing does provide the job opportunities and security that is so important nowadays."*
>
> *"If only my high-school career advisor had recommended nursing as a suitable occupation for males…I wish to specialise in critical care or mental health."*
>
> *"I came in to nursing from an engineering background, which was a dead-end job for me. I was quite bored and needed some exciting challenge and meaning to life."*

For some students it was the family members who were inspirational and supportive in their decision to choose nursing. One such student stated:

> *"I was inspired by my fiancée's brother who is a nurse. Besides, I was also tempted by the prospect of travel as nursing is a portable career."*

A few students alluded to the allure of the healthcare staff of a hospital as part of the influence in his choice of nursing, as per the following student comment:

> *"My childhood memories are mostly of the care I received in hospitals by the special people who worked there – I had made a resolve very early in my life to be like them and contribute to human society in a meaningful way."*

Men's reasons for becoming nurses may in some cases be complex or multifactorial, but their underlying motives are usually related to personal fulfillment or a way of providing service to humanity. The ideology of nursing as women's work is well established, requiring men to have strong motivation, beyond merely seeing it as a suitable occupation, to enter and remain in the profession (Harding 2009; Hemsley-Brown & Foskett 1999). However, university nursing students have a positive attitude towards male nurses and believe that male and female nurses could work together in harmony. For instance, Jasmine [an international student in Year 3] stressed that *"in today's changing times, what really matters is how a service was provided rather than who* [male or female] *provided the service"*. Abdul [also in Year 3] concurs with the view held by Jasmine: *"a combination of male and female approaches to caring has the potential to take the concept of nursing care to a higher level to serve the complex needs of clients of today and of future"*. While female students were generally very supportive of males, this was frequently not the case in the workplace. It is hoped that the positive attitudes of current BN students will continue into the workplace.

4.8 Chapter review

The world-wide shortage of nurses, coupled with government initiatives to increase enrolments in nursing programs, has resulted in rapid expansion of Australian BN courses between 2004 and 2007. Consequent to the globalisation of education, NSW has attracted students from numerous countries, including large numbers from Asian countries such as China, Korea and Nepal. At ACU (NSW), and elsewhere, the initiative to increase student intake in to nursing courses resulted in diversification of the student population during the study period, 2005 to 2009. During 2005 to 2007 in this study, the proportion of first year male student participants increased from 12.0% to 16.5%. Approximately, 60% of

students were in the 20-30 years age bracket, while the proportion of school-leavers remained low at 20%. Of the school-leavers enrolling into BN course at ACU (NSW), Australian male entrants were fewer than Australian female students.

The three BN first year (2005, 2006 and 2007) cohorts had similar demographic characteristics such as increasing numbers of commencing students, increasing male enrolments, and students' age profile. Nursing cohorts were similar with respect to students' cultural, linguistic and ethnic backgrounds. The cohorts did not differ significantly in terms of students' reasons for having chosen the nursing profession. Male and female students embarked upon a nursing career with various interests and intentions, including career opportunities in healthcare, job security, travel and immigration, altruistic interests, and pathway to other careers. At least a few (4) international students disclosed that they were also influenced by the prospect of securing Australian Residency in their decision to enroll in to an Australian nursing course.

An increasing trend was noted in beginning male students who stated that nursing was their first career choice. Many male students were motivated to choose nursing for the varied work opportunities and job security that nursing offers. Career aspirations were gender specific as some males stated that they intended to work in high pressure specialty areas such as accident and emergency, critical care and mental health while many female students indicated preference for specialising in paediatrics, midwifery, general care and aged care. Some male students were altruistically inclined whereas others were more interested in nursing as a pathway to other health related careers such as medicine.

The three first year cohorts differed in that students were increasingly living in parental homes. There was a significant increase (from 57.1% to 81.8%) in the numbers of males speaking English as a second language from overseas. Many students had previous life experiences, including work experience as an Assistant in Nursing (AIN), whereas many were new to science and the nursing discipline. 38% to 43% of first year students commenced the nursing course with little or no science education in the past five or more years, or were returning after a long

absence from formal study, and feared learning science. A decreasing trend was noted in the proportions of students commencing nursing studies with little or no science education.

The proportion of nursing students with children increased from 13.9% in Year 1 to 28.2% in Year 3 of BN. Male students living with families held a common perception that financial worries were distracting them from studies, whereas female students living with families mainly complained of time constraints due to domestic responsibilities. A significantly higher proportion of first year mature-aged students were working between 15-35 hours per week than school-leavers. In progressing from Year 1 to Year 3, the proportion of male students working 15-35 hours/week increased from 43.9% to 73.0%, and proportions of females working long hours increased from 52.0% to 68.5%. Many mature-aged male and female students experienced difficulties in balancing study, work and family commitments. Engaging in paid employment (up to 14 hours) may impact positively on nursing students through the acquisition of responsibility and organisational ability, and communication, time management and practical skills. However, working excessive hours was found by students to be stressful and hindered learning.

There was a common perception amongst male and female BN students that nursing was a suitable career for both genders. University nursing students believe that male and female nurses could work together effectively and in harmony to cater to the healthcare needs of society.

Chapter 5

Discussion of Results - Nursing Students' Perceptions of Study, and Learning Experiences in the Science Units

Chapter 5: Discussion of Results - Nursing Students' Perceptions of Study, and Learning Experiences in the Science Units

5.1 Introduction

The described demographic information about the undergraduate nursing student population in this study assisted the analysis of students' academic perceptions and experiences in the science units. This chapter focuses on the following primary aims of this investigation:

- develop awareness of the 21st Century nursing students' academic expectations, perceptions and experiences of learning science;
- examine undergraduate BN students' study behaviours and investigate whether they change over the duration of the course;
- identify the problems and challenges that large cohorts of undergraduate nursing students face as a consequence of the rapid unplanned changes due to the sudden expansion (since 2004) in the BN course;
- identify the effects of factors such as gender, age, and ethnic background on learning strategies and trends in students' expectations, perceptions and experiences of the BN and, in particular, of learning science;
- analyse how/or if students' perceptions and values, particularly of the science content, change or evolve over the duration of the BN course.

In this chapter, information is presented about students' changing perceptions and experiences of tertiary study, with an emphasis on the science component of the undergraduate nursing program. The focus is on an evaluation of students' preferences for learning science, and their study behaviours in a rapidly changing educational environment. Nursing students' perceptions of learning and teaching, learning approaches and preferences of mode of instruction in the science units are analysed with respect to differences in gender, age and linguistic backgrounds. A study of students repeating a science unit is also included, and these students' reasons for experiencing difficulties are identified and their study behaviours analysed. Social justice issues of nursing students are also examined.

5.2 The tertiary academic environment

5.2.1 The rapidly changing learning environment

Traditionally, the path to a university degree has been enrolling in university upon completing high school and attending full-time until graduation. This has changed in recent decades. Students in nursing programs in current and recent times are frequently older, have more family responsibilities and work more (usually part-time) for pay, compared to 25 years ago. Such "non-traditional" student cohorts are particularly evident in the School of Nursing at the Australian Catholic University (ACU) in NSW. Increased intakes and changes to entry requirements of nursing students at ACU (NSW) since 2004 led to diverse cohorts. The nursing students in this study (refer to Chapter 4) represented a broad spectrum in terms of age, experience, culture, ethnicity and level of preparedness for university education. This heterogeneity had the potential to impact on the undergraduate learning environment.

5.2.2 First year students' experiences of university life and nursing studies

Having survived the first semester, students in the second semester seemed well orientated to university life and the course. Thematic analysis of focus group discussion transcripts, assisted by Wordle (online software) to create "word clouds", gave some insight into students' experiences of nursing studies at ACU (NSW). A "Word Cloud", created using transcripts of first year focus group discussion sessions, is shown in Figure 5.1.

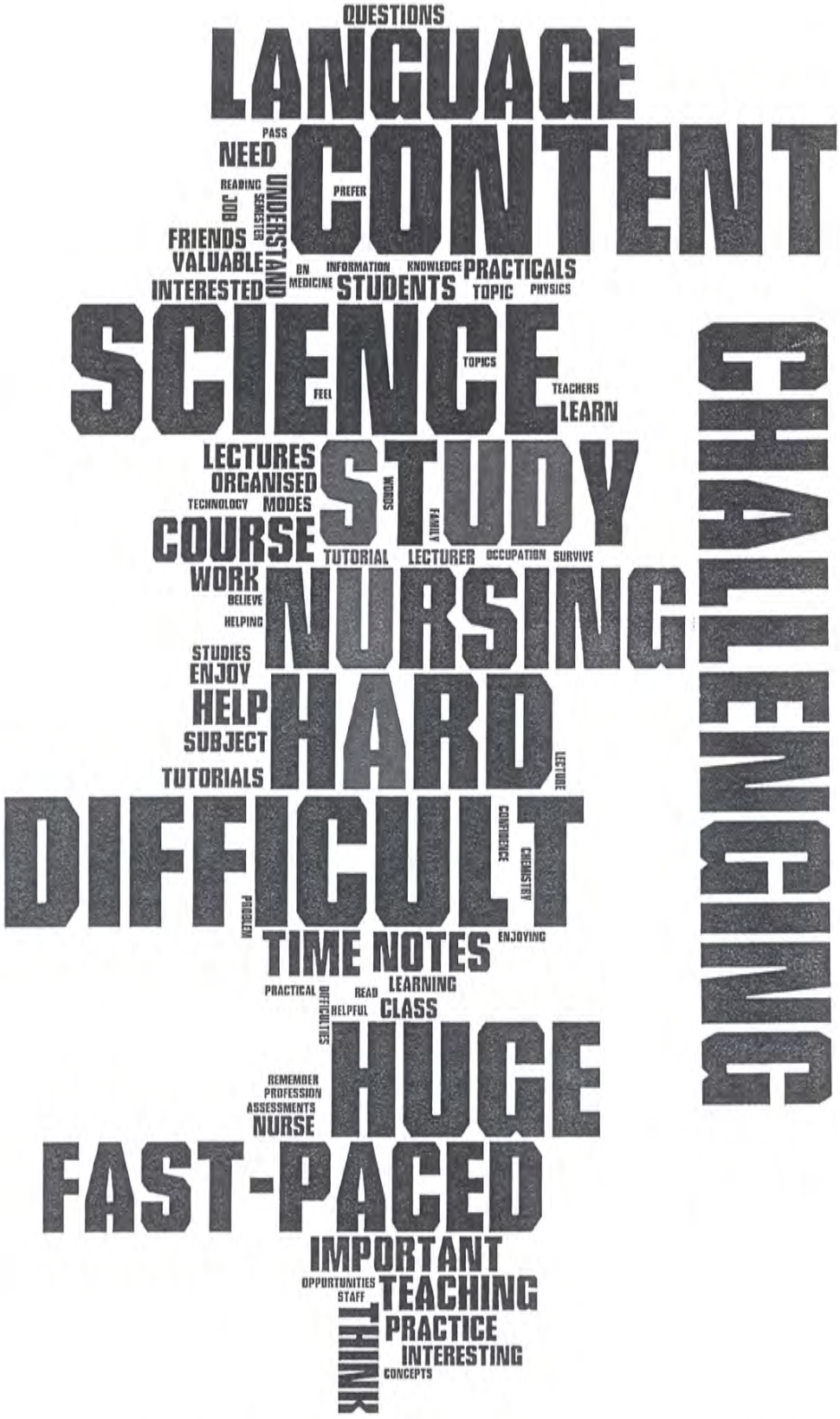


Figure 5.1: Word Cloud of first year focus group discussion transcripts showing student perception of the BN course and of learning science

(Combined data of first year BN focus group discussion transcripts)

The Word Cloud shows that the first year nursing students frequently used words like "difficult", "challenging", "language", "huge", "content", "fast-paced", "hard", and "science" in focus group discussions. An initial experience of many first year nursing students was that the Bachelor of Nursing (BN) course was *"difficult"* because it was *"fast-paced"* and there was *"huge* [amount of] *content"*. A common perception of first year students regarding nursing education was that the course was *"more challenging than originally expected"*, particularly because *"learning science was hard"*. Many students found that it was difficult to *"understand and remember the huge* [amount of] *content"*, and that *"it was hard to adjust to many different teachers and teaching styles"*. One first year student's comment about study load and the pace of teaching was: *"Compared to high school, the study load is much* [more] *intense and the teaching is fast-paced. A lot of material is covered in a day and it all keeps accumulating - it's hard to keep up"*.

Although many students were ambitious about a nursing career and commenced studies with positive perceptions of nursing, student diversity coupled with increasing student numbers invoked feelings of isolation in some beginning students within minority groups. Students who were far away from family, friends, support systems and home felt home-sick. Sample statements (from first year focus groups transcripts) indicating this theme include:

> *"There are only a few students on campus from my country, and none of them are in the first year – that makes it hard for me."*
>
> *"I'm from overseas and I really miss home. I don't know many people here. I feel very bored and tell myself: just 2½ more years."*
>
> *"Every day I think about making friends, but language problem...Things are different back home. Here, I don't have much to talk about..."*

Some culturally and linguistically diverse (CALD) international students' early experiences of the learning environment, together with their language difficulty, resulted in their remaining quiet and lonely. These students struggled to engage in study, possibly because they were experiencing "culture shock" and needed more time to adjust to Sydney and the Australian society. They stated that they encountered difficulties with learning in English and answering questions that

required written expanded answers – this is shown by the verbatim examples below:

"I passed the IELTS requirement for admission, but when I start the course I found my level of English not good enough. English too hard... very, very difficult for me. I sit there in lectures but not understand much of it. Same in other classes. Now I'm repeating the unit this semester."

"I'm from non-English-speaking background. I only learnt English in Australia. After class, I have to spend more time with biology, particularly science terms. I need to use the dictionary a lot. It's not the intelligence problem but the language problem. Skills in language would help me in studies."

"It's difficult to understand the content. Even if I may know the answer to a question, I find it hard to write the answer."

One-to-one interviews with a few international students shed more light on personal issues faced by some students. Some comments of a female student from an African country are given below (taken from notes of interview with the first year student):

"I had my student visa rejected many times. When I did get the visa, I came to Australia with my husband, but left my 4 year old son with my mother for some months before bringing him here. Then I had to arrange for his schooling and care...It was very stressful time.
I felt that nursing was the only way to gain permanent residency in Australia, so my sister kindly sponsored me with the fees. But I have to give that amount back to her someday... The fees are very high, so I must work. Luckily I found work in aged-care. I sometimes send money to my family for things like medical expenses, younger brother's education costs...
In the orientation week, I saw flag of my country amongst other flags - that made me feel welcome and proud of my nationality. At 30+ I felt too old to be a student again, I felt embarrassed but the emphasis Academic Skills and other support staff placed on needs of mature students comforted me. I did Biology at High School 10 or 11 years ago, so it was difficult for me but I did not miss any lecture.
At first, I was scared at the amount of computer use required in study because there were only 2 or 3 computers for the managers in the company that I worked for in my country. So I never used computer before. Other student friends helped me to use the computer. Now I'm very proud that I am learning to use the computer.
There are a lot of financial worries. But I just need to continue to work hard, study hard. It's good that uni is supportive, staff and friends are helpful..."

Some students indicated that their relationships with their instructors, peers and families had strong positive or negative effects (data from student interviews). Struggling students, especially, appreciated the encouragement, mentoring and patience of the academic staff. These students commended the academic guided "peer support" initiative that was implemented at ACU (NSW) for the first year nursing science students in Semester 1 of 2009 (Robinson et al. 2010). Conversely, Amaro et al. (2006) reported that some ethnically diverse students in nursing programs in America experienced staff-related problems such as intolerance, insufficient cultural sensitivity, and humiliation in front of other students. A few (approximately 5%) participants in this study at ACU disclosed that family members were encouraging and supportive, and that some parents provided or assisted with financial support allowing them to cut back on work to have more time for study. However, family was also the source of much stress for participants as many students had to work to support themselves and their families. Approximately 3% of students even struggled with family expectations of achieving high grade or graduating within a specific timeframe.

A few school-leavers indicated that they experienced problems interacting with mature-aged students or settling into a study routine (data from one-to-one interviews). For many young students, pressures of social and domestic life compounded with the pressures of academic life, and time for paid work cut into study time. Consequently, students who were time-restricted tended to feel unprepared for study and were overwhelmed by the study load.

Some mature-aged students experienced difficulties in balancing study, paid employment and family obligations – this was exemplified by statements such as:

> *"Full-time uni and part-time work meant that I had no social life. At times, I nearly gave in to the pressures..."*
>
> *"I enjoy uni classes but I need to work up to 20 hours per week to support my family, and feel too tired for extra study at home...I lose my motivation."*

Approximately 42% (n = 118) of the mature-aged students (in the three successive first year cohorts) returned to formal study after a long break, and had

life and work experiences to assist their transition into nursing studies. However, some had very little previous education or skills in science. While some students had previous work experience as an Assistant in Nursing, others were new to science and the discipline of nursing.

Some first year nursing students reported in this study that they had experienced stress while settling into university life and a study routine. This included the stress associated with a new living environment (e.g. transition from secondary to tertiary education, and from home country to Australia), difficulties with understanding and remembering science theories and concepts, assessments (e.g. several assessments in a short period of time), and the desire to succeed (e.g. high expectation of academic performance but finding the course difficult). Such stress was even more acute for groups that had a delay in returning to formal higher education. This is consistent with the findings of other researchers (Boelen & Kenny 2009; Thalluri et al. 2005; Bolam & Dodgson 2003).

The first year of university study is the most critical time for engaging students with their learning community so that they acquire the requisite skills to not only persist but to be successful and independent in their learning throughout the course and beyond (Krause 2005). Successful transition to the tertiary environment in the first year of the course increases students' overall satisfaction with their undergraduate experience as well as the likelihood of degree completion (Krause 2005; Yorke & Thomas 2003).

In this study, students reported being surprised by the intellectual demands of the undergraduate nursing course. This resonates with the work of Andrew et al. (2008). Twenty-one commencing BN students had considered nursing to be a soft option as an academic discipline, but this perception changed within the first year with 18 (out of 21) students reporting that their perceptions of nursing changed after their first clinical experiences due to having a better understanding of the *"rationale behind nursing interventions"*. *Other reasons for change in student perceptions* were *"the nursing role"*, *"the complexity of nursing"* and *"the high level of work involved in nursing"*, consistent with other reports in literature (Watson et al. 2008; Sand-Jecklin & Schaffer 2006). While some enjoyed and

managed study well, others had to make many adjustments to settle into university life and study routine. In each Year 1 cohort, some students (up to 35) who find the theoretical and practical components of nursing studies overwhelming usually leave the course during the first semester, often within the first month. Students' reasons for "dropping out from the course" were not investigated in this study, although two first year students (2006 cohort) alluded to the difficulties of learning science. However, there are reports that some students leave because of academic failure (Pryjmachuk et al. 2009; Kevern et al. 1999; others leave early because they expect to fail (Andrew et al. 2008). Particularly, mature-aged students tend to question their ability to learn at a university level and fear embarrassment and failure; this anxiety and fear impacts on their self-esteem (Fleming & McKee 2005; Steele et al. 2005). The pressures of attempting to combine pre-registration nursing program with family commitments were major factors in student attrition in Australia, United Kingdom and USA (Andrew et al. 2008; Rudel 2006). However, it has also been reported that mature-aged students are more likely to be assertive and pro-active in requesting assistance (Fleming & McKee 2005; Ofori 2000).

The prevailing perceptions of responding second and third year students, summarised in a Word Cloud (Figure 5.2), in focus group discussions were reverberations of those reported by first year students, although the students were generally more settled and study oriented after their first year experience. The Word Cloud in Figure 5.2 shows that the second and third year students frequently used words like "science", "knowledge", "important", "integration", "relevance", "nursing", "practice", "learning", "strategies", "reading", "text-books", "writing", "notes", "supplementary", "exam", and "questions". This is because students discussed the importance and relevance of science to nursing practice and how they learnt from the various teaching modes to develop effective learning strategies (discussed later in this chapter) such as preliminary reading of text-books, writing supplementary notes, and practising past exam questions.

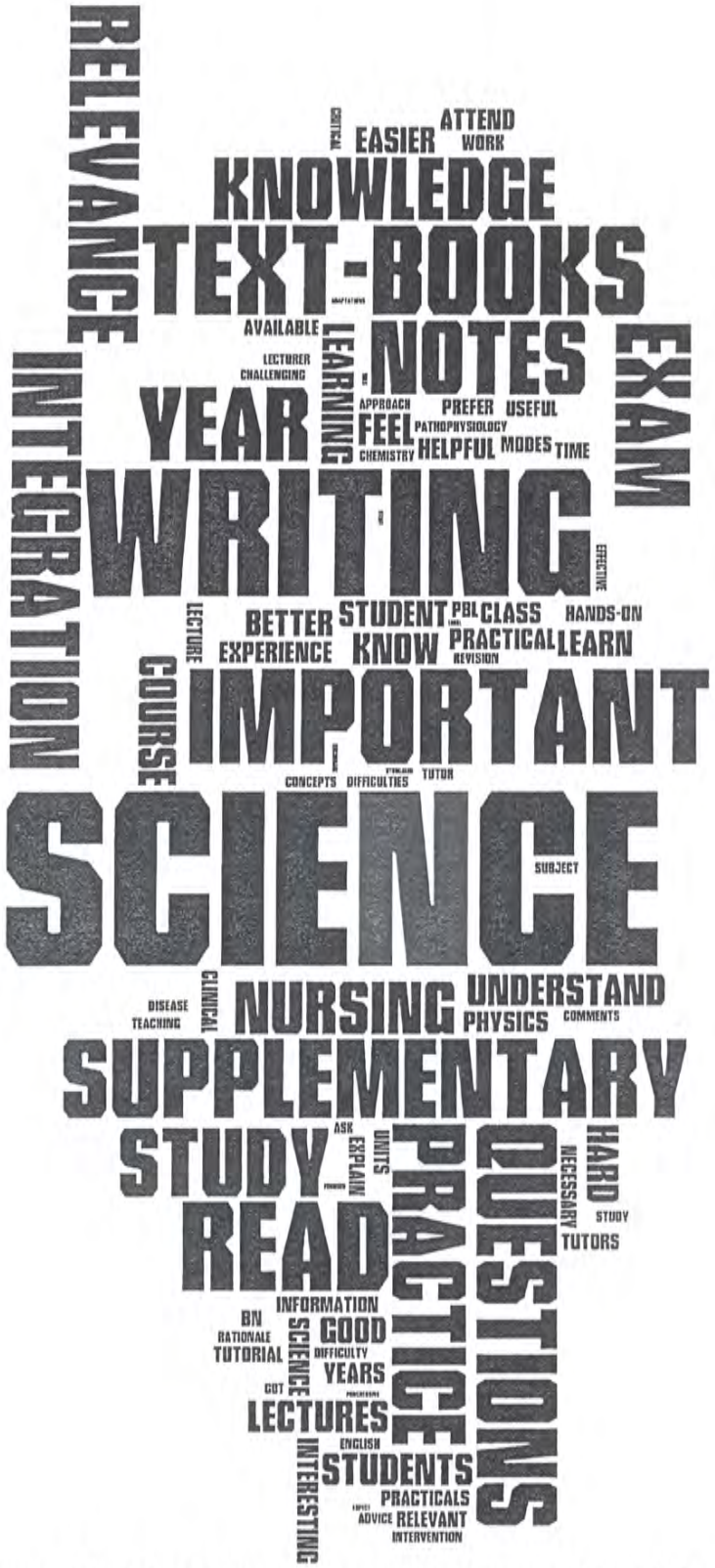


Figure 5.2: Word Cloud of combined second and third year focus group discussion transcripts showing student perception of effective learning strategies and the importance of science to nursing practice

(Data of Year 2 and Year 3 focus group discussion transcripts were combined to generate the Word Cloud)

Based on findings from survey data, discussions with focus groups and other students, Figure 5.3 shows a concept map summarising the many factors impacting on the nursing students. Academic progress may be hindered for those students taking longer to make the required adjustments to settle into the university life.

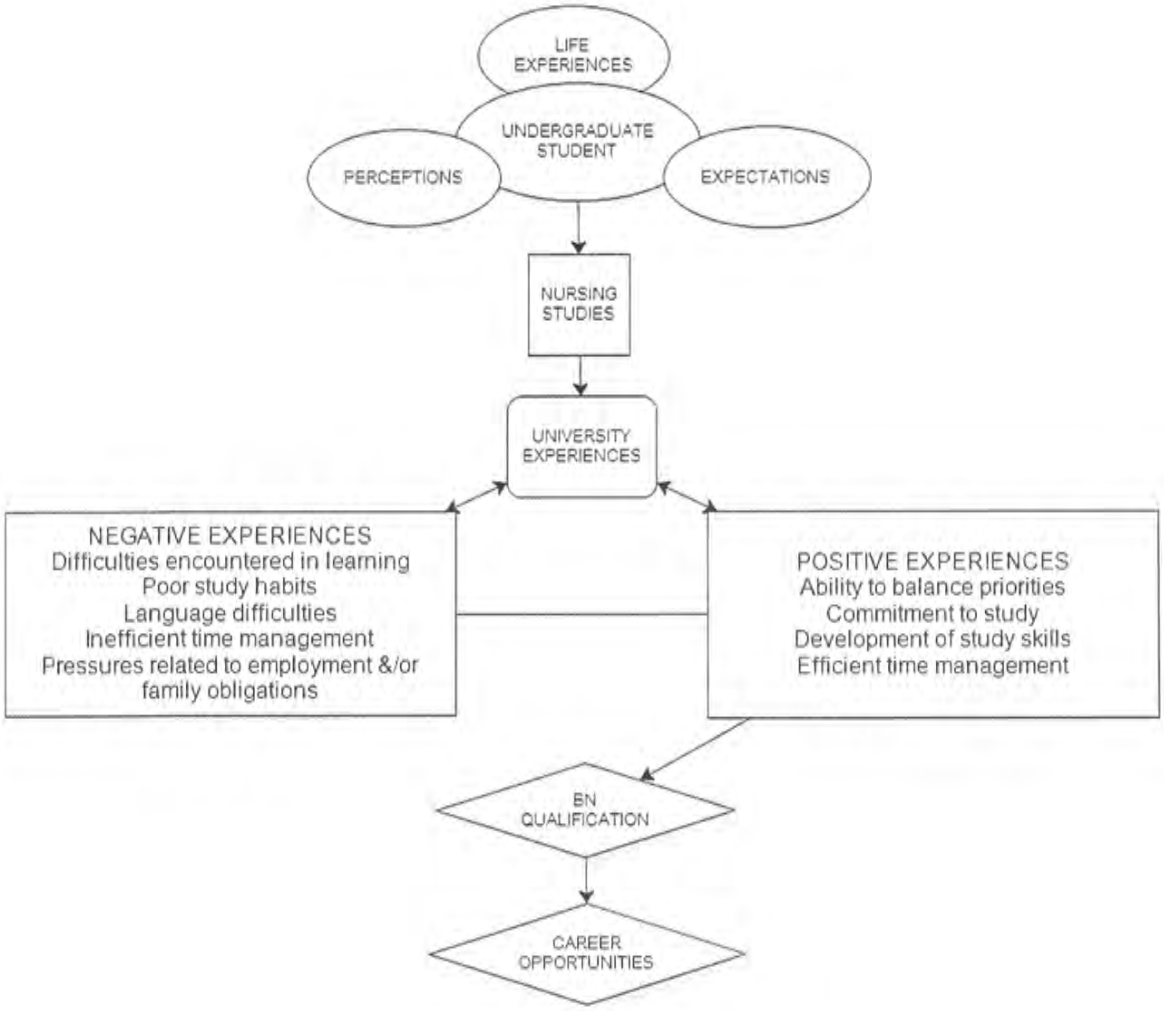


Figure 5.3: Summary of factors impacting on BN students

In the present study, the mature nursing students showed evidence of stress. In the three successive first year cohorts (2005-2007), 246 students reported experiencing stressful problems relating to learning science, the nursing course, time management, and domestic and social circumstances. Of the 246 students reporting stress, 19.9% were school-leavers, 59.3% were in the age group 20 to 30 years, and 20.7% were over 30 years of age. Some of these students

expressed a high level of concern about studying science, perceiving it to be the most difficult aspect of their nursing program, significantly more difficult than nursing practice. These findings are supported by those of Gresty and Cotton (2003) who investigated the fear and anxiety of nursing students (in UK) studying science.

Compared to younger students, mature-aged students with families tended to work longer hours and to struggle to balance family, study and work commitments. Some students also seemed to require more time and training to become familiar with advancing technology. Some faced language difficulties in addition to having to work in paid employment to support themselves financially (Watson 2006; Shakya & Horsfall 2000). Working more than 16 hours per week has been reported as detrimental to the academic performance of nursing students (Salamonson & Andrew 2006) because work commitments cut into study time. As more than 40% of respondents across Years 1, 2 and 3 were employed and working between 15 and 35 hours per week, and more than 60% reported difficulty balancing study and work (Chapter 4), students' commitment to continue the BN course was closely monitored. Table 5.1 shows cumulative responses of the three consecutive first year cohorts (2005 to 2007), second year cohorts (2006 to 2008), and third year cohorts (2007 to 2009) to a questionnaire item assessing students' commitment to continue the BN course. Despite experiencing hardship, it was encouraging to see that 97% of nursing students were determined to persist in the BN course.

Table 5.1: Student response to "Do you think you will continue and complete the BN course?"

Response	Year 1 cohorts % (n)	Year 2 cohorts % (n)	Year 3 cohorts % (n)
Yes	**96.7** (468)	**97.0** (417)	**97.0** (427)
No	**3.3** (16)	**3.0** (13)	**3.0** (13)

The remaining 3% indicated uncertainty perhaps because they were struggling to cope with university studies and/or were contemplating a further career change. These numbers may be disproportionately low as many of the non-participating

students could have considered leaving the course. Those students who perceived that the nursing content differed from what they expected were more likely to discontinue nursing studies. Typical statements from students who discontinued university studies include *"university wasn't what I expected"*, *"I disliked studying"*, and *"I wanted to change course"*.

The structure and design of a nursing course has the potential to modify and influence the aspirations and desires of students (DEST 2001) as it is the first exposure to nursing. Students are very impressionable during the beginning year and need to make many adjustments before settling down into a study routine. They need to prioritise and balance educational, paid employment, and social obligations while becoming familiar with the campus, course and the cohort. Initial positive experiences (whether social, academic or administrative) play an important role for students in building up enthusiasm and confidence, while negative experiences not only discourage students but also hinder academic progress. Beginning students entering nursing generally have an idealistic or traditional view of nursing and specific expectations of their educational experiences (Fisher et al. 2002). They usually value the profession and have positive perceptions of practice (Sand-Jecklin & Schaffer 2006).

As academic performance is linked to nursing students' ability to develop effective study skills and manage their time effectively (Mehta et al. 2008; Thalluri et al. 2005), students with pressures of family, work and study may benefit from developing good study habits, and managing their time well to dedicate more time to study whether on or off-campus.

Recruiting nursing students from CALD backgrounds play a valuable role in meeting the health care needs of multi-ethnic and multi-lingual societies (Miguel & Rogan 2009; McMillan 2007). However, some international CALD students needed assistance in their development of learning skills for tertiary study and to become independent learners (Mehta et al. 2008).

5.3 Difficulties posed by language

International nursing students from CALD backgrounds faced a double hurdle - that of learning in English and of assimilating scientific terminology. Amongst these students who had achieved the minimum entry requirements of competency in English language, many struggled to write notes or ask questions in tutorial classes, and to follow basic assessment-related instructions (refer to student comments previously listed - section 5.2.2). A student achieving the score of 6.5 may have a level of English that is adequate for conversation and non-discipline-specific reading, but higher levels of proficiency are required to successfully cope with the verbal and written academic demands of the BN course (Salamonson & Andrew 2006; Shakya & Horsfall 2000).

Between 69% and 79% of Year 1 respondents (Table 5.2) indicated that progress in English language would help with their nursing studies. This perception of the importance of English proficiency to nursing studies was a significant trend ($p < 0.001$) amongst first year cohorts of 2005 to 2007. Proficiency in the language of instruction is important for learning in any discipline.

Table 5.2: Students' perceptions of impact of improved English proficiency on nursing studies

Student response	Group A % (n)	Group B % (n)	Group C % (n)
"I believe that progress in English would help me with my studies."			
Year 1	2005	2006	2007
Agree/Strongly agree	**68.9** (91)	**72.5** (108)	**78.6*** (154)
Disagree/Strongly disagree	**31.1** (41)	**27.5** (41)	**21.4** (42)
Year 2	2006	2007	2008
Agree/Strongly agree	**64.8** (94)	**73.6** (109)	**67.4** (97)
Disagree/Strongly disagree	**35.2** (51)	**26.4** (39)	**32.6** (47)
Year 3	2007	2008	2009
Agree/Strongly agree	**70.7** (99)	**66.2** (92)	**64.9** (109)
Disagree/Strongly disagree	**29.3** (41)	**33.8** (47)	**35.1** (59)

* χ^2=16.200, df =1, $p < 0.001$ (Comparison of 2005 and 2007 cohorts)

The first year students were more likely, than second and third year students, to be conscious of the value of English proficiency as they grappled with the basic sciences early in the course. On progressing through the course, many students

retained the sense of importance of language but felt less concerned about language difficulties as they gained proficiency and strengthened their study habits. There was a decreasing trend (not significant) in the percentage of third year students who stated that progress in English language would help in their studies.

In focus group discussions students from CALD backgrounds indicated that they preferred the use of simple English in both, the teaching and assessments:

> *"Main problem for us oversea*[s] *students is that of English language and difficult scientific terminology".*

Many students were less confident of their command of written English than spoken. A first year student disclosed:

> *"I hated the assignment where we had to write an essay. Luckily, attending the Academic Skills session helped* [me] *a lot"* (note taken from one-to-one interview with a first year student).

Most (65% to 79%) of CALD students in each of the three years of the BN course believed that improvement in their level of English proficiency would enhance their learning and lead to better academic performance (Mehta et al. 2008), which supports the findings of other authors (Salamonson et al. 2009; Shakya & Horsfall 2000).

Some CALD students are overwhelmed and stressed by having to learn a new vocabulary, grammar, academic writing and to explore and understand concepts from the biosciences, nursing and social sciences (Shakya & Horsfall 2000). Based on personal observations made by the researcher in his problem-based learning (PBL) and tutorial classes, there was limited participation by some international students from CALD backgrounds in class discussions. These students found it difficult to adjust to the style of university teaching, comprehend academic content, and appeared less comfortable in class discussions. Despite having ordinary conversational competency but they often lacked writing and discussion skills, and their work and domestic commitments caused them to miss

out on support offered by the teaching and academic skills staff. Other international CALD students from minority ethnic groups took to seclusion (felt shy, remained lonely and silent, and hesitated to ask questions) due to difficulty integrating with other ethnic groups, particularly with native English-speaking who also were reluctant to engage at times. If they are not identified quickly and nurtured early in the first year, they are likely to not only struggle with their studies, but may drop out or take longer to complete the course. Effective communication is a significant part of nursing, and fluency in language is pivotal to student engagement in learning activities, social interaction and creating learning communities (Tinto 2008; Krause 2006). While it has been reported that students achieve and perform better in cooperative learning environments (Tinto 2008; Wilson et al. 2006), a study at ACU (NSW) found that formation of learning communities through academic guided peer support served to enrich the overall learning experiences and academic performance of first year nursing students (Robinson et al. 2010).

5.4 Nursing students' use of campus facilities

5.4.1 Resources and support initiatives

It was necessary to explore if and how well students availed themselves of certain support facilities offered on campus. ACU provides adequate resources and a number of workshops to assist and enhance students' experience of learning and university life. These workshops include:

- Learning at University
- Academic Skills
- Using the Library & IT at ACU
- Office of Student Success Workshop: "What is Success?"
- Studying Effectively with a Medical Condition or Disability
- Balancing Life and Study
- Finding Part-Time Work

Other academic support opportunities at ACU include consultation with lecturers for learning related difficulties. However, many students seemed reluctant to use this support service, and continued to struggle in the science units.

As a large proportion of the heterogeneous body of nursing students were mature-aged and from CALD backgrounds, two indicators considered most important as supportive to academic progress of students were the use of library resources such as books and workshops for improving English literacy and academic skills. The workshops offered by the Academic Skills Unit aim to assist students with academic writing, communication and other aspects of learning.

5.4.2 Participation in language and academic skills workshops

Over the course of this study, there was an increasing trend ($p < 0.01$) in the percentage of first year students who stated that they attended workshops for improving academic and language skills. Second year cohorts also showed an increasing trend (although not reaching significance) in the percentage of students reporting to have attended the support workshops run by the Academic Skills Unit – Table 5.3.

Table 5.3: Nursing student participation in language and academic skills workshops

Student response	Group A % (n)	Group B % (n)	Group C % (n)
"I participate in courses/workshops to improve communication skills."			
Year 1	2005	2006	2007
Agree/Strongly agree	**55.6** (75)	**61.6** (90)	**65.4*** (125)
Disagree/Strongly disagree	**44.4** (60)	**38.4** (56)	**34.6** (66)
Year 2	2006	2007	2008
Agree/Strongly agree	**45.8** (65)	**52.7** (77)	**60.0** (81)
Disagree/Strongly disagree	**54.2** (77)	**47.3** (69)	**40.0** (54)
Year 3	2007	2008	2009
Agree/Strongly agree	**60.6** (83)	**53.5** (69)	**58.9** (96)
Disagree/Strongly disagree	**39.4** (54)	**46.5** (60)	**41.1** (67)

* $\chi^2 = 12.500$, df = 1, $p < 0.001$ (Comparison of 2005 and 2007 Yr 1 cohorts)

Third year students found these support workshops beneficial as well, as indicated by their usage reports. However there were students in each of the cohorts who did not attend for various reasons ranging from not seeing the need to lack of time or motivation. Since the responding students did not make widespread use of support opportunities, it is possible that the non-respondents by-passed all support options.

5.4.3 Frequency of borrowing science books from the university library

Supplementing course work with additional text-book reading is one of many effective strategies for student success. Reading science text-books is an important aspect of the nursing science unit as it may broaden students' knowledge base and confers a deeper comprehension of scientific principles underpinning nursing practice. At the commencement of each science unit, students were given a list of prescribed text(s) and recommended texts. The responses to the questionnaire item "Do you borrow science books from the university library?" were analysed as one indicator of students' use of campus facilities. Table 5.4 shows reported students' pattern of borrowing science books from the university library. Scaled responses for borrowing "sometimes" and "regularly" were combined and compared with the responses "No" and "rarely" to allow an overall comparison between students borrowing and not borrowing science books.

Table 5.4: Information on students' frequency of borrowing science books from the university library

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
Year 1	2005	2006	2007
Sometimes/regularly	**35.4** (51)	**36.9** (59)	**51.8#**(103)
No/rarely	**64.6** (93)	**63.1** (101)	**48.2** (96)
Year 2	2006	2007	2008
Sometimes/regularly	**33.5** (52)	**48.3** (73)	**39.0** (55)
No/rarely	**66.5** (103)	**51.7** (78)	**61.0** (86)
Year 3	2007	2008	2009
Sometimes/regularly	**28.1** (39)	**44.4***(63)	**47.6****(81)
No/rarely	**71.9** (100)	**55.6** (79)	**52.4** (89)

$\chi^2 = 17.558$, df = 1, $p < 0.001$ (comparing 2005 and 2007 Year 1 cohorts)
* $\chi^2 = 5.647$, df = 1, $p = 0.017$ (comparing 2007 and 2008 Year 3 cohorts)
** $\chi^2 = 14.7$, df = 1, $p < 0.001$ (comparing 2007 and 2009 Year 3)

It was encouraging to see a statistically significant increasing trend in the percentage of first year and third year students stating that they regularly or sometimes borrowed science books from the university library ($p < 0.01$). However, it was of concern that 48% to 72% of nursing students rarely, if at all, borrowed relevant science text-books. As one first year student remarked: *"Reading library books was important for passing the science unit,* [it's] *not*

enough to rely only on lecture notes" (free-text response to survey item "Any additional comments"). However, a high proportion (> 50%) of students seemed to only use the library for computer access.

Factors contributing to these results may be that some students did not perceive the need to borrow books from the university library because they may have purchased text-books or preferred to access information online and/or rely on course notes. Students' in the 21st Century have a higher preference for using the internet to search information (Kramer 2010; Gabbert & Sims 2007) than for using the library-fixed resources (INFLIBNET 2004). Some struggling students were not able to fully capitalise on the campus supportive resources and facilities due to time constraints caused by work, family, social and other obligations while others may have low motivation and poor commitment to studies. Despite a tertiary education culture of increasing student independence, the value of campus time cannot be overlooked.

Students spending more time on campus interact amongst themselves, and are more likely to fully utilise the campus resources (Tinto 2008; Krause et al. 2005) such as the library and, therefore, borrow and read books to supplement their learning (Radcliffe et al. 2008; McMillan 2007). Not spending sufficient time on campus restricts peer learning (Farquharson 2007). In between classes, many students may meet and learn together in a library or a similar setting. Therefore, students' use of the library is possibly, in essence, an extension of class-room learning. It is the student-staff and student-student interactions (whether in the lecture theatre, tutorial room, practical laboratory, library, or academic skills workshop) that lead to improvements in students' computer, literacy and communication, social and academic skills, and the promotion of deep and lifelong learning skills.

5.5 Students' computer competency and preference for learning technologies

Students' perception of their competency in using electronic (computer) technology for learning was investigated. Electronic technology refers to the use of the Learning Management System (LMS) and internet to access online material

- that is, information and communications technology (ICT). It is noteworthy that online learning, e-learning, distance learning, and web-based learning are often used as interchangeable terms. A summary of nursing students' perception of their computer literacy is shown in Table 5.5.

Table 5.5: Responding students' perception of confidence in using electronic technology for learning

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"I find it easy to use electronic technology for learning."			
Year 1	2005	2006	2007
Agree/Strongly agree	**81.6** (120)	**84.1** (132)	**88.4** (175)
Disagree/Strongly disagree	**18.4** (27)	**15.9** (25)	**11.6** (23)
Year 2	2006	2007	2008
Agree/Strongly agree	**85.4** (129)	**84.9** (129)	**89.0** (130)
Disagree/Strongly disagree	**14.6** (22)	**15.1** (23)	**11.0** (16)
Year 3	2007	2008	2009
Agree/Strongly agree	**92.5** (136)	**93.2** (136)	**91.3** (158)
Disagree/Strongly disagree	**7.5** (11)	**6.8** (10)	**8.7** (15)

Combined data of male and female students. Scaled responses collapsed to get an overall indication of students comfortable in using electronic technology for learning.

A high proportion of nursing students (82% to 93%) reported that they found it easy to use electronic technology for learning, or e-learning. There was an increasing trend in students' (of Groups A, B and C) perceptions of having achieved high computer literacy in progressing from Year 1 to Year 3, which did not reach significance - for instance, Group A: 81.6% in 2005 → 92.5% in 2007 (χ^2 = 1.000, df = 1, p = 0.317). A minority (6.8% - 18.4%) experienced difficulty in adapting to e-learning, which may have impacted their learning to some extent throughout the course. In the three successive first year cohorts, there were 75 students who reported difficulty with e-Learning; of these approximately 84% were female students, 60% were in the 20-30 years age group (15% school-leavers, 25% over 30 years), and 66% were international students from CALD backgrounds.

The majority (72% - 100%) of male nursing students (of 2005 to 2009 cohorts) stated that they were competent in using electronic technology for learning – see

Table 5.6. Both genders appreciated the convenience of online access to course notes and practice questions. The small percentages of students not competent in the use of computer technology were mature-aged students. There was a decreasing trend in male and female students' negative responses (disagree/strongly disagree) about their perceptions of competency as they progressed through the course, indicating that most of these students were able to acquire the required skills through practice and support from university staff and from fellow students.

Table 5.6: Male students' perception of their competency in using electronic technology

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"I find it easy to use electronic technology for learning"			
Year 1	2005	2006	2007
Agree/Strongly agree	**72.2** (13)	**85.7** (18)	**90.6** (29)
Disagree/Strongly disagree	**27.8** (5)	**14.3** (3)	**9.4** (3)
Year 2	2006	2007	2008
Agree/Strongly agree	**82.4** (14)	**86.8** (33)	**90.5** (19)
Disagree/Strongly disagree	**17.6** (3)	**13.2** (5)	**9.5** (2)
Year 3	2007	2008	2009
Agree/Strongly agree	**81.5** (22)	**100.0** (29)	**92.9** (26)
Disagree/Strongly disagree	**18.5** (5)	**0.0** (0)	**7.1** (2)

Scaled responses collapsed to get an overall indication of students comfortable in using electronic technology for learning

Similarly, a majority (83.6% - 94.9%) of female students indicated that they were adept at using electronic learning technology (Table 5.7).

Table 5.7: Female students' perception of their competency in using electronic technology

Student response	Group A % (n)	Group B % (n)	Group C % (n)
"I find it easy to use electronic technology for learning"			
Year 1	2005	2006	2007
Agree/Strongly agree	**83.6** (107)	**85.8** (115)	**88.0** (146)
Disagree/Strongly disagree	**16.4** (21)	**14.2** (21)	**12.0** (20)
Year 2	2006	2007	2008
Agree/Strongly agree	**85.8** (115)	**85.7** (84)	**88.2** (112)
Disagree/Strongly disagree	**14.2** (19)	**14.3** (14)	**11.8** (15)
Year 3	2007	2008	2009
Agree/Strongly agree	**94.9** (112)	**91.4** (106)	**91.0** (132)
Disagree/Strongly disagree	**5.1** (6)	**8.6** (10)	**0.9** (13)

Scaled responses collapsed to get an overall indication of students comfortable in using electronic technology for learning.

Electronic competency is positively associated with learning activities and outcome (Gabbert & Simms 2007; Krause et al. 2005). Academics should be aware of students' computer skills and arrange to provide necessary training and support to students struggling with electronic learning technologies. Acquisition of good computer skills is currently crucial not only for making progress in tertiary education, but is beneficial in the workplace as well. Most students are likely to have a computer where they live (91.7% of the first year nursing students had a personal computer - a finding from the pilot study, Mehta et al. 2008), and all students have access to an adequate supply of computers at the campus library and computer laboratories at ACU (NSW). Students tend to develop computer skills rapidly depending on easy access to computers, whether a personal laptop (a growing trend noted amongst university students) or a university computer, and frequency of usage.

In addition to face-to-face, on-campus teaching modes at ACU, nursing science lecturers post course notes, important announcements, quizzes and practice questions on the Learning Management System (LMS) for students' perusal. The use of online resources, together with good computer literacy, empowers students to take control of their learning and keep up in their studies. Furthermore, they are able search information (access research journals), type up assignments, and

communicate with staff and other students by using email or discussion forum of LMS. Nursing students have found the online resources and support provided by the academics of science units effective. Positive comments by students include:

> *"Online access to course notes, quiz, answers and other resources helped me to keep up with Bio* [science unit]." (First year student, focus group transcript).
>
> *"Blackboard* [LMS] *was useful and convenient because everyone had access to the revision guide, latest announcements, assessment marks and other information...like having supplementary notes and self-directed learning* [SDL]." (Second year student, focus group transcript).
>
> *"Electronic submission of assessment was convenient."* (Third year student, focus group transcript).

In this, and other studies, student attitudes towards computers or e-learning were positive in terms of motivation and interest (Hussin et al. 2009; Zhu et al. 2008), as development of technologies offers new pathways for educators to reach their learners. Technology-supported learning environments have the potential to encourage students to actively participate in and shape their personal learning experiences (Hodges 2004). The internet has provided a new mechanism for connecting teachers and students as it promotes 'active learning' through engaging students in the learning process (Glass & Sue 2008; Farquharson 2007; Krause et al. 2005, page 42).

According to Arsham (2002), online learning can be as effective as the traditional classroom learning environment, because students participate in the process of learning via discussion board (Saddick 2001). Conversely, in traditional lectures, there is no use of electronic technology, such as slides or PowerPoint, just a verbal lecture with perhaps the use of chalk (Van den Broek 2009). Early visual aids to the lecture format and class presentations included scrawling and drawing on a board, or transmitting information using slides or transparencies by overhead projectors (Hewitt 2008). Since the release of Microsoft PowerPoint in 1990, PowerPoint presentations have become very popular in higher education, and have been effectively used when students were expected to retain complex graphics, animation, and figures (Van den Broek 2009).

Online learning opportunities are increasing as they facilitate the pursuit of educational goal in beginning nursing students as well as Registered Nurses who pursue further studies for career advancement while continuing to work (Gabbert & Sims 2007). Advantages of online learning in health education include overcoming barriers of distance (physical location) and time (flexibility in timing of participation), while disadvantages include social isolation (learner studying alone), up-front costs (expensive to set up online course), and technical (computer) problems (Cook 2007). Online learning cannot replace, and will probably never replace, traditional learning.

5.6 Student perceptions and experiences of learning science

5.6.1 Students' perceptions of nursing and of science

Nursing students began their first year nursing studies at ACU (NSW) generally with a positive perception of nursing and of science. Nursing provides opportunities *"to care for people"*, *"save lives"* and *"help people get better"*. Findings from a study of students entering the BN program at a large Faculty of Nursing in Sydney were similar; these students viewed nursing as *"promoting human well being and health"*, followed closely by *"nursing as a professional activity"*, and lastly as a *"medical and technical activity"* (Fisher et al. 2002).

At ACU, students accepted that knowledge of science is necessary for nursing practice, and that science is important for *"health and well-being"*, *"prevention, control and management of disorders"*, and *"medical advances"*. (Comments taken from free-text survey responses of second year students).

Bioscience is a life science that deals with biological aspects of living organisms. Manninen (1998) defined nursing science as *"the body of scientific knowledge that guides nursing practice"*. The science units offered in the BN program at ACU (NSW) provide a foundation in health science through integrated teaching of components such as human anatomy, physiology, pathophysiology and pharmacology. It is important that nursing students grasp the principles, and understand concepts, of these science components because there is little margin for error in nursing practice. Scientific knowledge is needed so that interventions have a rational basis; modern nursing is more than simply understanding new

procedures or treatments, but rather providing evidence-based high quality care (Melesis 2005; Thalluri et al. 2005). Melesis (2005) further states that the best practices in nursing are developed through research conducted by nurse scientists.

The teaching of science in the nursing curriculum has long been identified as problematic and source of anxiety by teachers, students, and even practicing nurses, worldwide (Gresty & Cotton 2003; McKee 2002; Nicoll et al. 1996). Clancy et al. (2000) expressed concern that science education was not meeting the needs of nursing students in the UK. Academic staff involved in nurse education have disagreed on numerous issues such as appropriate content and depth of science knowledge required (Bullock & Manias 2002; Trnobranski 1993), time that should be devoted to teaching, and the value of different teaching strategies (Gresty & Cotton 2003; Davies et al. 2000). Some nursing schools in Australia are reducing the science component of the BN degree while others are increasing it (Robinson 2009). Doctors, other healthcare professionals, and patients assume that nurses have a sound understanding of the procedures and treatments that they administer. However, while the procedural knowledge of nurses may be acceptable their scientific understanding is often poor (Jordan & Reid 1997).

Active learning and critical thinking is encouraged as much as possible by the teaching staff at ACU (NSW), using various strategies. Collaborative learning is fostered through guided interactive activities such as a group assignment requiring poster presentation or PowerPoint presentation. A mentoring approach facilitates critical thinking (as in problem-based learning). Students are set tasks that require literature searches and comprehension exercises (as in self-directed learning, online quiz and submission of an essay).

In a 10-week semester, the science units had 7 contact hours of teaching per week, made up of:

Teaching mode	Hours per week
Lecture	Three*
Tutorial	One
PBL	One
Practical	Two

*Three 50-minute lectures per week

According to free-text comments made by a few second year students in surveys, there was an indication of a preference for an extra class per week for revision of important science concepts, rather than a significant reduction of the science content. Nursing students valued the science units, as shown in Table 5.8. Note that the majority of male (84% - 100%; see Table 5.8) and female (91.2% - 98.5%; see Table 5.9) students gave similar responses in the surveys.

Table 5.8: Proportion of male students valuing the nursing science units

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"How much do you value the science units in the nursing program?"			
Year 1	2005	2006	2007
Value/Highly value	**84.2** (16)	**100.0** (22)	**100.0** (33)
Not much/Not at all	**15.8** (3)	**00.0** (0)	**00.0** (0)
Year 2	2006	2007	2008
Value/Highly value	**94.1** (16)	**100.0** (33)	**100.0** (20)
Not much/Not at all	**5.9** (1)	**00.0** (0)	**00.0** (0)
Year 3	2007	2008	2009
Value/Highly value	**92.6** (25)	**93.3** (28)	**92.9** (26)
Not much/Not at all	**7.4** (2)	**6.7** (2)	**7.1** (2)

Scaled responses collapsed to get an overall indication of students valuing nursing science units

Table 5.9: Proportion of female students valuing the nursing science units

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"How much do you value the science units in the nursing program?"			
Year 1	2005	2006	2007
Value/Highly value	**94.6** (122)	**98.5** (133)	**95.8** (113)
Not much/Not at all	**5.4** (7)	**1.5** (2)	**4.2** (5)
Year 2	2006	2007	2008
Value/Highly value	**91.2** (124)	**96.0** (97)	**94.8** (109)
Not much/Not at all	**8.8** (12)	**4.0** (4)	**5.2** (6)
Year 3	2007	2008	2009
Value/Highly value	**94.0** (157)	**97.6** (123)	**93.8** (136)
Not much/Not at all	**6.0** (10)	**2.4** (3)	**6.2** (9)

Scaled responses collapsed to get an overall indication of students valuing nursing science units

Students recognised that scientific knowledge was crucial for success in clinical practice, and stated that they specially valued the science units. Furthermore, there were no statistically significant differences in responses between successive cohorts. It is very likely for many of these male and female nursing students that their strong interest in clinical science was an influence in their decision to pursue a nursing career. It is speculated that the small number of students who did not see much value in nursing science, including those not attending science lectures, were likely to be content with a minimal knowledge of science.

Male students often sat with other male students in lectures, and grouped together where possible. In the second and third year, males seemed to manage studies by grouping themselves in the same tutorial and practical classes – Photographs 5.1 and 5.2.

Photograph 5.1: Male BN students in a practical class in a science laboratory
(Photograph used with students' permission)

Photograph 5.2: Male BN students in a practical class in a nursing laboratory
(Photograph used with students' permission)

In focus group discussions, students were often asked to comment on their perception of science in nursing. Nursing students' enthusiasm for knowledge of science is evident from their responses, such as:

"Science does make nursing interesting and safe." (First Year student).

"Scientific knowledge and skills make nursing practice more meaningful, more professional." (Second Year student).

"Science is the main subject in the BN course because it helps us to understand the disease process and the rationale behind treatment." (Third Year student).

Nursing students generally regard science to be among the most valuable course components because it enables them to understand the fundamental principles behind disease processes and management strategies (Thalluri et al. 2005). Students perceive that a good knowledge of science is crucial for safe nursing practice (Friedel & Treagust 2005; Melesis 2005).

5.6.2 Student perceptions of science as a subject difficult to learn

In focus group discussions, first year students commonly used words such as *"hard"* or *"difficult"* to describe their experiences of learning science. Some student comments were:

"It has been 11 years since I studied science, so has been hard to remember."

"Language difficulty, and lack of science background."

"Some teachers use language we do not yet have an understanding of, it's to[o] *academic. I do not have English as a second language, and I still have problems."*

"I found it very hard to remember [the science content] *as I don't have a background in science."*

"Don't have enough time to read text books thoroughly."

"Sometime[s] it is too hard to understand in the class, had to do a lots of self study."

"I have never study Physics before and only a little bit Chemistry and Biology." [sic]

"I would find it useful if there were extra classes for people who have not studied Chemistry or Physics as I struggle with this part of course."

Preliminary findings of the present study were that many nursing students, including mature-aged and international students from non-English speaking

backgrounds (NESB), feared the study of science (Mehta et al. 2008) and then started developing interest in and valuing science (Mehta & Robinson 2010). Some students found it difficult to comprehend scientific concepts, whereas others struggled to develop sound learning skills or understand medical terminology (Mehta et al. 2008). Findings from focus group discussions and one-to-one interviews with first and second year nursing students at ACU (NSW) indicated that many perceived science to be a difficult subject from the onset of their course, possibly due to having insufficient science knowledge or previous negative learning experiences, including being taught by teachers who were inadequately prepared (Gresty & Cotton 2003).

5.6.3 Students' changing perceptions of science

Three cohorts (2005 to 2007) of Year 1 nursing students' perceptions of science prior to commencement of BN course were compared to their perceptions in Semester 2 of Year 1. The Year 1 Questionnaire items "Before commencement of the BN course, which of the following statements best described your perceptions of science?..." and "Having almost completed the first year of the course, which of the following statements best describe your perceptions of science?..." permitted students to give multiple responses – see Table 5.10 for summary of students' responses. As student responses to the questionnaire item were similar (no significant differences) between the three first year cohorts, data were pooled.

Table 5.10: First year nursing students' perceptions of science prior to BN and in Year 1

Student responses	Prior to BN **%** (n)	In Year 1 **%** (n)
Boring	**4.4** (38)	**2.3** (21) *
Difficult	**22.1** (193)	**21.3** (195)
Manageable	**16.5** (144)	**15.7** (143)
Easy	**1.4** (12)	**1.4** (13)
Interesting and relevant	**27.0** (236)	**27.5** (251)
Important for medical advances	**28.6** (250)	**31.8** (291)

*Significant reduction in students' response of science as 'boring' ($\chi^2 = 4.898$, df = 1, p = 0.027). Note: Pooled data of three first year cohorts (no significant differences in student responses between cohorts).

In the three successive first year cohorts, there was a significant reduction in the proportion of students finding science boring compared to their perceptions before commencing the BN program. 195 survey respondents reported difficulty in learning science, of which 88.5% were female students, 78.8% mature-aged, and 68.6% from non-English-speaking backgrounds (It is noteworthy that some culturally and linguistically diverse students had less difficulty with science than expected). There was a slight increase in the percentage of students who felt that science was important for medical advances. Very few students perceived science to be easy.

Table 5.11 shows the cumulative responses of three cohorts (2006 - 2008) of second year students. There were no significant differences between cohorts, so the data of the three second year cohorts were pooled. There was a significant increase in the proportion of second year students finding the study of science manageable ($p < 0.05$). The data also indicates a reduction in the proportions of students finding science boring or difficult, and very slight increases in proportions of those believing that science was interesting, relevant and important for medical advances. Only seven Year 2 students (0.9%) reported that science was an easy subject.

Table 5.11: Second year students' perceptions of science prior to BN and in Year 2

Student responses	Prior to BN % (n)	In Year 2 % (n)
Boring	**2.8** (21)	**1.9** (16)
Difficult	**23.4** (178)	**17.7** (145)
Manageable	**13.0** (99)	**16.7** (137)
Easy	**1.7** (13)	**0.9** (7)
Interesting and relevant	**28.1** (214)	**29.8** (245)
Important for medical advances	**31.0** (236)	**33.0** (271)

Significant increase in the students' response of science as 'manageable' ($\chi^2 = 4.898$, df = 1, $p = 0.013$). Note: Pooled data of three second year cohorts (no significant differences in student responses between cohorts).

Many students in their intermediate year of study were likely to have had a grasp of the foundation science subjects. On gaining scientific knowledge, more

students (compared to those prior to commencement of course) considered science to be interesting and became aware of the relevance of science to nursing practice and its importance for advances in medical technology. The beginning nursing students in this study had started to learn to value science more, although some continued to find science difficult. The few students who found science easy were most likely to have had sufficient science background (Thalluri et al. 2005; McKee 2002), have a strong interest in clinical science (Gresty & Cotton 2003; Vanhanen & Janhonen 2000), or were aspiring to continue further studies including, for example, medicine and physiotherapy after graduating with a BN degree (Hemsley-Brown & Foskett 1999).

The student perception of science as manageable continued to increase ($p < 0.01$) to the final year of the BN course, as shown in Table 5.12. Although not statistically significant, there was an increase in the proportion of students finding science important for medical advances, and decreases in the proportions of students who felt that the study of science in the nursing course was difficult and boring. The perception of science as hard (or not easy) remained throughout the three years of the nursing degree.

Table 5.12: Third year students' perceptions of science prior to BN and in Year 3

Student responses	Prior to BN % (n)	In Year 3 % (n)
Boring	**2.5** (20)	**1.9** (16)
Difficult	**17.0** (137)	**12.9** (110)
Manageable	**14.8** (119)	**19.4** (165)*
Easy	**3.0** (24)	**2.3** (20)
Interesting and relevant	**31.9** (257)	**29.1** (248)
Important for medical advances	**30.8** (248)	**34.4** (293)

*Significant increase in the third year students' response of science as 'manageable' compared to student perception prior to commencement of BN ($\chi^2 = 7.451$, df = 1, p = 0.006). Note: Pooled data of three third year cohorts (no significant differences in student responses between the three third year cohorts).

In progressing from the first to third year of the course, some students' perceptions of science changed from "difficult and boring" (34% decrease) to "interesting, relevant and manageable" (19% increase). 44.1% (156) of Year 1,

49.8% (144) of Year 2, and 62.7% (185) of Year 3 students were able to cope with the complexities of learning science by engaging in study through development of active learning strategies and positive study behaviours.

There were students who struggled and *"found it hard to keep up with"* the content in the science unit because of insufficient or very basic study of science subjects at high school or because of a long gap between secondary and tertiary studies so *"it was like starting science all over again"*, as indicated below:

> *"Have not studied chemistry for 20 years, so it is like a foreign language to me."*

A common experience of students was that the *"science unit was the most challenging"*. The following statement from one first year mature-aged student summed it up well:

> *"The first few weeks of science classes were a frightening ordeal for me because I found the science notes complicated. I dreaded the thought of failing. I knew I had to get organised fast and to put in many hours of self study each week to keep up."*

Students were able to increasingly appreciate the importance of nursing science as they progressed through to final year. Many had realised that understanding the science made it easier to remember the content rather than simply attempting to memorise, as indicated by the following statements:

> *"We received a lot of new information in the first year; second year made us think more, and the third year helped us to put everything together and apply the concepts that were learnt earlier. Now, I'm more enthusiastic and confident about science than ever before."*
>
> *"I appreciated science more as I got further through the course. At first I was nervous about the content, but after hard study, I started to embrace it more. In third year, it* [science] *became very relevant."*
>
> *"Definitely a progressive process from year 1 to 2 to 3. I got better at managing time, and developed good study habits and skills. It does become easier as you go along. You become a better learner...it comes with experience."*

Students felt that adjustments to domestic, social and working life were critical in the first year and that if they were able to adapt successfully to a study routine then it would be much easier to concentrate on second and third year science units. In progressing through to the final year science unit, students generally felt that the "pressure" eased somewhat. However, a few struggled throughout the course. This was evident from statements like:

> *"In the beginning* [year], *chemistry and physics were hard because I didn't study science at High School, but later pathophysiology and pharmacology were even harder."*

High subject-related anxiety was unavoidable because students with a wide range of abilities were enrolled in the same cohort. Some (approx 60%) students had scientific knowledge and/or skills from working as an Assistant in Nursing while others had no prior knowledge of nursing science. Those students (up to 38%) who were not well prepared for clinical science were under pressure because of the need to pass the unit before progressing through the course. They were aware of their peers possessing higher levels of scientific understanding and ability in the discipline. Many such students learnt to cope with pressures of study by studying together in groups, often in the campus library – Photograph 5.3.

Photograph 5.3: A group of first year nursing students studying together
(Photograph used with students' permission)

At ACU (NSW), an overwhelming majority (94.9% to 98.7% - sum of "Agree" and "Strongly agree" responses in Table 5.13) of nursing students appreciated the value of science in the BN program. Many students conceded that science was relevant to nursing practice, and that "nursing can't survive well without science". Table 5.13 shows how the students responded to the questionnaire item on the relevance of science to nursing. As there were no significant differences amongst cohorts of the same year of study, data were pooled for Year 1 cohorts of 2005 – 2007, Year 2 cohorts of 2006 – 2008, and Year 3 cohorts of 2007 - 2009.

Table 5.13: Students' perception of the relevance of nursing science

Student response	Year 1 cohorts % (n)	Year 2 cohorts % (n)	Year 3 cohorts % (n)
"I appreciate the relevance of science to nursing."			
Strongly disagree	**0.0** (0)	**0.0** (0)	**0.0** (0)
Disagree	**5.1** (25)	**1.3** (6)	**2.2** (10)
Agree	**63.0** (306)	**56.9** (256)	**56.8** (263)
Strongly agree	**31.9** (155)	**41.8** (188)	**41.0** (190)

Significant difference between Agree and Disagree responses for all cohorts of Years 1, 2 & 3 ($p < 0.001$). Significant difference between Disagree responses of Year 1 and Year 2 cohorts ($p = 0.001$). Note: The data of three cohorts for each year of study were pooled as there were no significant differences amongst cohorts of the same year.

Students who were not convinced of the relevance of science to nursing were likely to have a low opinion of their ability in science, whereas those who performed well usually had positive perceptions of science (observation based on preliminary study and student discussions). A few students' negative comments about their perception of science (taken from focus group transcripts of Year 1 students) were:

> *"I was never good at science. I don't see why we need to learn this difficult stuff in all that detail."*
>
> *"I thought nursing was about taking care of the sick, but didn't realise* [that] *we needed to learn so much science. I just hope to pass."*

Students' positive comments about their perceptions of nursing science (taken from focus group transcripts of Years 1, 2 and 3) include:

"Understanding the science component of nursing has made me more confident and enthusiastic about clinical practice."

"Knowledge of science is crucial in understanding the body functions and dysfunction, treatment and side-effects, etc."

"Science underpins nursing practice and improves the quality of care."

"Skills in science and technology empower nurses to minimise errors, enabling them to be confident and competent in their work".

Students' responses to the questionnaire item on students' perception of integration of science units with other nursing and clinical units are shown in Table 5.14. The majority (more than 80%) of BN students in all cohorts studied (2005 to 2009) reported that the science and nursing units integrated quite well.

Table 5.14: Students' perception of integration of science units with other nursing units

Student response	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"How well have the science units integrated with the nursing and clinical units you have studied?"			
Year 1	2005	2006	2007
Not very well	**11.7** (17)	**18.7** (29)	**8.7** (17)
Quite well	**77.3** (112)	**60.7** (94)	**75.0** (147)
Extremely well	**11.0** (16)	**20.6** (32)*	**16.3** (32)*
Year 2	2006	2007	2008
Not very well	**4.6** (7)	**5.3** (8)	**11.0** (16)
Quite well	**60.7** (91)	**68.7** (103)	**63.5** (92)
Extremely well	**34.7** (52)	**26.0** (39)	**25.5** (37)
Year 3	2007	2008	2009
Not very well	**6.9** (10)	**11.8** (17)	**2.3** (4)
Quite well	**62.3** (91)	**60.4** (87)	**61.4** (105)
Extremely well	**30.8** (45)†	**27.8** (35)	**36.3** (62) †

**Horizontal study:*
Year 1 cohorts (only) of 2006 and 2007 showed a significant increase (χ^2=5.333, df=1, p=0.021) in the perception of integration of science and clinical units as "extremely well".

†*Longitudinal study:*
Group A showed a significant increase (χ^2=13.787, df=1, p<0.001) in the perception of integration of science and clinical units as "extremely well". Group C showed a significant increase (χ^2=9.574, df=1, p=0.002) in the perception of integration of science and clinical units as "extremely well".

Horizontal study:

Only Year 1 cohorts of 2006 and 2007 showed a significant increase ($\chi^2 = 5.333$, df = 1, p = 0.021) in the perception of integration of science and clinical units as "extremely well", compared to Year 1 cohort of 2005. Year 2 cohorts (2006-2008) showed a decreasing trend in perception of integration, which did not reach significance. Year 3 cohorts (2007-2009) showed no trends in perceptions. There were significant increases in the percentages of students reporting that science units integrated "extremely well" with other nursing units: approximately 16% in Year 1 to 29% in Year 2 ($p < 0.01$) and 32% in Year 3 ($p < 0.001$).

Longitudinal study:

Group A (Yr 3 cohort of 2007 compared to Yr 1 cohort of 2005) showed a significant increase ($\chi^2 = 13.787$, df = 1, $p < 0.001$) in the perception of integration of science and clinical units as "extremely well". Group C (Yr 3 cohort of 2009 compared to Yr 1 cohort of 2007) showed a significant increase ($\chi^2 = 9.574$, df = 1, p = 0.002) in the perception of integration of science and clinical units as "extremely well". Group B (Yr 3 cohort of 2008 compared to Yr 1 cohort of 2006) showed an increasing trend in perception of integration of the units.

Although most nursing students appreciated that there was integration between the science and clinical units, the longitudinal study particularly shows evidence that, as students progress through the BN course, they increasingly become convinced of the importance of science to nursing practice, and of the relationship (integration) between the nursing science and clinical units.

It is possible that students who struggle to associate scientific knowledge with clinical practice hold negative perceptions of science. The proportions of students who indicated a negative response of integration of science and other nursing units ranged between 2.3% and 18.7%, comprising more Year 1 students than Year 2 or 3 students. There were significant decreases ($p < 0.01$) in the percentages of Year 2 and Year 3 students having negative perceptions compared to Year 1 students. This is to be expected as many commencing students were not able to fully appreciate where science fitted in. First year

students having a negative perception of integration of science and clinical units were mostly female students in the age group 20-30 years, of NESB – Table 5.15.

Table 5.15: First year nursing students having a negative perception of integration of science and clinical units

Demographic factor	2005 n	2006 n	2007 n
Gender			
Female	13	26	14
Male	4	3	3
Age			
<20 years	2	6	1
20–30 years	9	22	10
>30 years	6	1	6
Linguistic background			
ESB	2	6	3
NESB	14	23	14

ESB: English-speaking background; NESB: non-English-speaking background

A few second year students acknowledged that nursing and science units integrated very well by making positive comments such as:

> *"Science makes nursing interesting. There's good overlap of some topics in science units and in nursing units."* (free-text survey response)

Many Year 2 students had a better perception of the value of science, as they spoke from experience (focus group transcript):

> *"My perspective on need for science changed. I now believe that science is very important for RNs because having scientific knowledge gives us confidence."*
>
> *"As nurses, we need to have knowledge of the drugs that we're giving to patients."*
>
> *"The science is really needed in nursing; the more science we learn, the more I believe that we cannot do without it."*

Third year students commented that science was the most important of their nursing subjects and emphasised the value of understanding the disease process and the rationale behind treatment. This is evident from statements such as:

> *"Without science, we could not understand any of the nursing interventions, nor apply anything to clinical practice. It would be hard to explain anything to patients."*
>
> *"Having fundamental science knowledge, and understanding the body processes is satisfying because it enables nurse to be independent and to interpret medical reports and pathology results effectively."*
>
> *"Science creates a more critical thinking nurse and that is what makes the difference."*
>
> *"It is not enough* [for a nurse] *to just perform a technical task. A nurse should be able to care and actually evaluate information to make informed decisions."*
>
> *"Science is pushing the nursing role forward. It's so interesting, and being able to understand it is a great feeling."*

Overall, students across the three years of the BN degree were able to see the importance of scientific knowledge to nursing practice and believed that the integration of science and clinical units enabled them to make the theory-practice links between scientific knowledge and nursing intervention. This was further supported by the finding that the proportions of students perceiving the science component of the BN course to be "too much" decreased from 18.7% - 31.3% in Year 1 to 7.6% - 13.8% in Year 3 (see Table 5.16); and conversely, the proportions of students stating that there was "not enough science" increased from 4.0% - 10.6% in Year 1 to 15.2% - 19.3% in Year 3, as students became more accepting of the value and relevance of science in nursing. The literature identifies a continuing trend amongst nursing students describing a lack of sufficient science in pre-registration nurse education (Davis 2010; Clancy et al. 2000; Jordan & Reid 1997). There are reports of graduate nurses feeling unprepared and lacking confidence in the workforce (Newton & McKenna 2009; King 2004; Manias & Bullock 2002; Jordan & Reid 1997). For instance, one year after graduation, nurses in Sweden emphasised the importance of education and training in science (Andersson & Edberg 2010).

Table 5.16: Students' perception of amount of science per year

Student response	Group A % (n)	Group B % (n)	Group C % (n)
"Comment on the amount of science in the current year of the BN course."			
Year 1	2005	2006	2007
Too much	**31.3** (47)	**26.3** (42)	**18.7** (37)
Not enough	**4.0** (6)	**10.6** (17)	**6.6** (13)
Enough	**64.7** (97)	**63.1** (101)	**74.7** (148)
Year 2	2006	2007	2008
Too much	**18.5** (29)	**21.7** (33)	**21.4** (31)
Not enough	**5.7** (9)	**11.2** (17)	**9.0** (13)
Enough	**75.8** (119)	**67.1** (102)	**69.6** (101)
Year 3	2007	2008	2009
Too much	**13.8***(20)	**13.1**† (19)	**7.6**‡ (13)
Not enough	**19.3**$^{\#}$(28)	**15.2** (22)	**18.1**$^{\Psi}$(31)
Enough	**66.9** (97)	**71.7** (104)	**74.3** (127)

*Significant decrease in the students' response (Yr 3 versus Yr 1) of science as being 'too much' ($\chi^2 = 10.881$, df = 1, p = 0.001).
†Significant decrease in the students' response (Yr 3 versus Yr 1) of science as being 'too much' ($\chi^2 = 8.672$, df = 1, p = 0.003).
‡Significant decrease in the students' response (Yr 3 versus Yr 1) of science as being 'too much' ($\chi^2 = 11.520$, df = 1, p = 0.001).
$^{\#}$Significant increase in the students' response (Yr 3 versus Yr 1) of science as being 'not enough' ($\chi^2 = 22.533$, df = 1, p < 0.001).
$^{\Psi}$Significant increase in the students' response (Yr 3 versus Yr 1) of science as being 'not enough' ($\chi^2 = 7.364$, df = 1, p = 0.007).

These changes in perceptions of nursing science may be a consequence of the learning process upon progressing through the science and nursing units of the BN degree and acquiring clinical experiences and nursing skills. The majority (63% - 76%, p < 0.001) of nursing students across the three years of the BN degree course indicated that there was "enough science" compared to those who claimed that there was "not enough". There were significant reductions in students' perception of science content being "too much" as they progressed from first year through to third year. This is attributed to the role of maturity as well as students valuing the science more as they continued to link scientific theory with clinical practice upon progressing through their training. However, notable numbers of students (7.6% - 13.8%) continued to consider the science content excessive – this is indicative of the differences of opinion that extend into the nursing community (Jasmine 2009; Darbyshire 1999; Trnobranski 1996). There was a significant increase in the percentages of students claiming that there was "not enough science" on progressing from first year to the third year. This may be

related to increasing numbers of males in nursing, as males traditionally have been more accepting of science-based content than females (Kane-Berman 1998). In order to determine the demography of the students who desired more science in the BN course, data of Years 1, 2 and 3 was analysed further. As responses amongst cohorts of the same year of study were similar, results were pooled –Table 5.17.

Table 5.17: Demography of students who desired more science in the nursing course

Demographic factor	Year 1 cohorts n	Year 2 cohorts n	Year 3 cohorts n
Gender			
Female	30	34	65
Male	6	5	16
Age			
<20 years	6	2	-
20–30 years	21	26	52
>30 years	9	11	29
Linguistic background			
ESB	8	12	20
NESB	28	27	61

Year 1 cohorts of 2005, 2006, 2007. Year 2 cohorts of 2006, 2007, 2008. Year 3 cohorts of 2007, 2008, 2009.

Table 5.17 shows that increasing numbers of students, both genders, perceived that there was "not enough science" in the science units. Student perception of "not enough science" in the BN course increased on progressing through the three years of undergraduate study, with higher numbers of students from NESB than those from ESB believing that there should be more science in the course. This is an interesting finding because higher numbers of nursing students from NESB (compared to those from ESB) in their first year (see Table 5.15) held negative perception of integration of science and clinical units. In the three first year cohorts, there were 11 ESB and 51 NESB students who perceived that science and clinical units did not integrate very well. This negative perception of integration of the units changed to 10 ESB and 22 NESB students in the three

third year cohorts. This shows that students from NESB, although initially struggling with learning science possibly due to difficulties with English language, grew to see the integration of science and clinical units. Students desiring more science in the BN course significantly increased from 7.1% (8 students from ESB, 28 from NESB) of first year respondents (combined data of the three successive 2005-2007 cohorts) to 17.6% (20 students from ESB, 61 from NESB) of third year respondents (2007-2009 cohorts) ($\chi^2 = 17.308$, df = 1, $p < 0.001$).

There were some students across the first, second and third year cohorts who were strongly inspired by the science component of nursing. The following free-text comments from student surveys exemplify their appreciation:

> *"The science unit is most organised. I'm motivated by the caring and supportive science lecturers who have inspired me to always think scientifically and to become a kind and caring nurse."* (Year 2 female student).
>
> *"The science course has strongly interested me and I am now considering heading into a more science-based career."* (Year 3 male student).

Some nursing students with a strong interest in clinical science progressed in their study of science so well that they actually desired to learn more science, and aspired to work in specialty areas such as emergency department (ED) or intensive care unit (ICU). This supports the findings of other researchers (Muldoon & Reilly 2003; Andrew & Vialle 1998).

5.6.4. Student preference for component(s) of science

The survey questions were designed to gather information about the science components that students found interesting to learn and relevant to nursing practice. The first science unit in the Year 1 curriculum covered basic anatomy, physiology, microbiology, chemistry and physics. The science components that students found interesting to learn were anatomy, physiology and pathophysiology; chemistry and physics were least preferred (Table 5.18). The results may be somewhat anomalous as some students may have had difficulty identifying boundaries between anatomy, physiology and pathophysiology.

Table 5.18: Student perception of interest in science component

Science component	Group A % (n)	Group B % (n)	Group C % (n)
"Which component of science do you find most interesting this year?"			
Year 1	2005	2006	2007
Chemistry & Physics	**13.4** (22)	**12.5** (24)	**8.5** (19)
Microbiology	**13.4** (22)	**26.6** (51)	**21.5** (48)
Anatomy & Physiology	**73.2** (120)	**60.9** (117)	**70.0** (156)
Pathophysiology	*	*	*
Pharmacology	*	*	*
Year 2	2006	2007	2008
Chemistry & Physics	**9.3** (21)	**3.4** (7)	**4.0** (8)
Microbiology	**6.2** (14)	**6.8** (14)	**5.5** (11)
Anatomy & Physiology	**48.2** (109)	**36.7** (76)	**42.2** (84)
Pathophysiology	**21.2** (48)	**37.7** (78)	**26.7** (53)
Pharmacology	**15.1** (34)	**15.4** (32)	**21.6** (43)
Year 3	2007	2008	2009
Chemistry & Physics	**4.7** (11)	**6.6** (14)	**4.0** (10)
Microbiology	**8.0** (19)	**8.0** (17)	**6.9** (17)
Anatomy & Physiology	**38.6** (91)	**36.8** (78)	**40.3** (100)
Pathophysiology	**33.5** (79)	**36.3** (77)	**35.5** (88)
Pharmacology	**15.2** (36)	**12.3** (26)	**13.3** (33)

* Component was not offered in the first year unit

According to information from focus group discussions, most students felt that the science knowledge gave them confidence in nursing practice, in educating patients and in communicating with other healthcare staff. They realised that a fundamental knowledge of science disciplines such as anatomy, physiology and pathophysiology was important in improving patient care and safety. Science knowledge empowered nurses to understand the structure-function relationship of body processes, diseases, and the rationale behind treatment (Friedel & Treagust 2005; King 2004).

In first year surveys, free-text comments from two mature-aged female students were:

> *"Initially struggled very much with the chemistry and physics components as* [I] *have never studied* [these subjects] *before. Trying to understand the concepts was difficult and time consuming,* [so] *most of my extra study time in initial weeks was dedicated to the physics and chemistry components."*

"I would find it useful if there were extra classes for people who have not studied chemistry or physics [before]..."

First year students found anatomy and physiology components in the science unit most relevant to nursing – Table 5.19.

Table 5.19: Student perception of relevance of science component to nursing

Science component	Group A % (n)	Group B % (n)	Group C % (n)
"Which component of science do you find most relevant?"			
Year 1	2005	2006	2007
Chemistry & Physics	**8.1** (14)	**11.6** (24)	**8.4** (20)
Microbiology	**19.5** (34)	**24.6** (51)	**23.1** (55)
Anatomy & Physiology	**72.4** (126)	**63.8** (132)	**68.5** (163)
Pathophysiology	*	*	*
Pharmacology	*	*	*
Year 2	2006	2007	2008
Chemistry & Physics	**6.0** (17)	**4.1** (10)	**5.1** (13)
Microbiology	**7.4** (21)	**8.2** (20)	**5.5** (14)
Anatomy & Physiology	**34.5** (98)	**35.6** (87)	**35.5** (91)
Pathophysiology	**23.2** (66)	**31.6** (77)	**25.8** (66)
Pharmacology	**28.9** (82)	**20.5** (50)	**28.1** (72)
Year 3	2007	2008	2009
Chemistry & Physics	**6.7** (19)	**3.4** (7)	**2.6** (7)
Microbiology	**7.0** (20)	**7.2** (15)	**3.4** (9)
Anatomy & Physiology	**29.9** (85)	**33.2** (69)	**40.8** (109)
Pathophysiology	**31.7** (90)	**44.7** (93)	**32.2** (86)
Pharmacology	**24.7** (70)	**11.5** (24)	**21.0** (56)

* Component was not offered in the first year unit

Students in Years 2 and 3 perceived anatomy and physiology, pathophysiology and pharmacology as more relevant to nursing practice than microbiology, chemistry and physics. Chemistry, physics and microbiology are small components of the BN curriculum and thus tend to be largely ignored by both course organisers and students. The reasons for the low rating of chemistry and physics were probably due to very little, if any, previous education of these science subjects, and some students failing to see their relevance to nursing practice. Also, there was very little content that focused on these topics in the course.

Students consistently found the study of chemistry, physics, and pharmacology more difficult than microbiology, pathophysiology, anatomy and physiology – Table 5.20.

Table 5.20: Student perception of difficulty of science component

Science component	Group A % (n)	Group B % (n)	Group C % (n)
"Which component of science do you find most difficult?"			
Year 1	2005	2006	2007
Chemistry & Physics	**50.3** (82)	**52.9** (91)	**57.7** (120)
Microbiology	**27.0** (44)	**23.3** (40)	**20.7** (43)
Anatomy & Physiology	**22.7** (37)	**23.8** (41)	**21.6** (45)
Pathophysiology	*	*	*
Pharmacology	*	*	*
Year 2	2006	2007	2008
Chemistry & Physics	**32.5** (67)	**38.9** (77)	**34.2** (66)
Microbiology	**16.0** (33)	**10.1** (20)	**14.5** (28)
Anatomy & Physiology	**12.1** (25)	**10.6** (21)	**7.8** (15)
Pathophysiology	**11.2** (23)	**12.6** (25)	**11.9** (23)
Pharmacology	**28.2** (58)	**27.8** (55)	**31.6** (61)
Year 3	2007	2008	2009
Chemistry & Physics	**33.7** (69)	**36.4** (67)	**34.8** (80)
Microbiology	**21.0** (43)	**27.7** (51)	**18.7** (43)
Anatomy & Physiology	**6.3** (13)	**6.0** (11)	**7.8** (18)
Pathophysiology	**10.7** (22)	**10.9** (20)	**9.6** (22)
Pharmacology	**28.3** (58)	**19.0** (35)	**29.1** (67)

* Component was not offered in the first year unit

The findings presented so far in this chapter show that nursing students across all stages (Years 1, 2 and 3) of their pre-registration education generally valued science components of nursing studies despite sometimes considering the material difficult.

5.6.5 Students' perceptions of learning and teaching in the science units

5.6.5.1 Students' learning preferences in the science units

In a first year focus group discussion, female nursing students, Jenny$^{\Psi}$ and Linda$^{\Psi}$, preferred lectures and practical laboratory sessions while David preferred scenario-based tutorials:

$^{\Psi}$ Pseudonym

"Lectures are very informative and put subject matter into context before more details are covered in tutorials and practicals."

"I learn a lot in the 2 hour practical classes. Prac[tical] *classes are effective because you can ask the lecturer many questions, even from lectures, or ask to go through important points again."*

"Interactive scenario-based tutorials are very effective because they keep me focused."

A common perception of teaching modes amongst second year students was that they preferred interactive learning where there was more class discussion by way of questions and answers:

"On-campus, face-to-face learning because I can visualise and understand better. More questions, more discussions – that teaching style is better for learning."

Preferences of third year students for the teaching modes varied. Anna[Ψ] stated:

"I prefer practicals because I learn more from a hands-on approach. In the 2-hour session I feel relaxed and can catch up on what I didn't understand from the lectures that week".

The implication in Anna's statement was that the pace of practical sessions allowed her to review and/or consolidate her understanding of related content covered in other classes during the week.

George[Ψ] realised the importance of teaching modes, and indicated:

"Although I prefer and value all the modes, I found that lectures and tutorials were important for my learning when I was in the first year; this changed to a higher preference for practical classes in the second year, and problem-based learning in the third year". By the third year, I had acquired sufficient knowledge and skills so that I was really motivated by PBL as it helped me to understand and remember the concepts, and also to monitor my learning".

Ψ Pseudonym

Many respondents in the third year of study were of the opinion that all teaching modes were necessary to get the broad knowledge because each mode gave a unique experience. *"Self-directed learning (SDL) encouraged students to research on their own"*, *"pracs* [practical laboratory classes] *helped to assimilate the knowledge"*, while some stated that problem-based learning (PBL) and tutorials were best because the students *"can concentrate better in a small, interactive group and ask questions for further clarification."*

When asked about how science could be made easier and more interesting to learn, students commented on their preferences of teaching approaches that reinforced various activities relating to learning, revision and assessment:

> *"I always find revision classes, quizzes, and spot tests in practicals very helpful."*
>
> *"We should have extra classes for people who need it, not compulsory but optional, which can be run as interactive tutorials."*
>
> *"Class tests are really helpful because they put you on the route to final exam."*
>
> *"Use more visual aids, I mean, more multimedia resources and video clips that show you metabolic activity, mechanism of muscle contraction etc."*

Most students manage to learn effectively if the teaching incorporates a good mix of visual, auditory, reading/writing, and kinaesthetic activities (James et al. 2011; Entwistle & Peterson 2004). Occasionally, a few students may have a strong preference for only one modality, and may struggle to understand when the materials are presented to them in their less preferred modes. The needs of such students may be met if the teaching is multi-sensory and filled with variety through the use of active learning strategies such as co-operative learning exercises, debates, role playing, simulations, models and games (Lujan & DiCarlo 2006; Tanner & Allen 2004). Nursing students were encouraged as much as possible by the science staff at ACU (NSW) to engage in active learning. Visual learners were targeted by the use of models and demonstrations in the practical classes and by photographs and diagrams in the PowerPoint slides shown during lectures. Auditory learners were reached through interesting and informative discourses, PBL, discussions during peer instruction, collaborative testing, games and

answering questions. Practical experiments were used to stimulate learning for the kinaesthetic and tactile "hands-on" learners. Active learning strategies enhance students' motivation to learn and apply new knowledge (Nelson & Angelo 2005). Students who are actively engaged in guided discussions and group work are more likely to develop problem solving and critical thinking skills (Stevens & Brenner 2009; Field et al. 2007; Matthews-Smith et al. 2001).

The aim of staff teaching the science units was to reach all the nursing students having diverse learning preferences, through multimodal teaching: lectures, tutorials, problem-based learning (PBL), self-directed learning (SDL) and practical laboratory classes. Most students felt that they were able to learn effectively as the multimodal teaching integrated visual, auditory, reading/writing and kinaesthetic activities. However, some students found it difficult to comprehend scientific concepts, whereas others struggled to understand medical terminology or develop sound learning skills (Mehta et al. 2008). Therefore the focus of this study included analysis of nursing students' learning preferences and approaches.

Increasing numbers of technologically adept nursing students at ACU (NSW) were reluctant to spend much time on campus, preferring to independently access lectures and other course materials online from remote sites. Despite a tertiary education culture of increasing student independence and preference for the convenient online access to course material, nursing remains a practice-based discipline, and face-to-face, on-campus learning cannot be substituted entirely by online course. In the case of nursing science units offered in the BN course at ACU (NSW), active on-campus instruction is the main mode of course delivery that is supplemented by passive online resources and support. Nursing students' current learning needs are changing as they prefer a mix of instructional strategies that incorporate interactive modes of instruction with independent, passive modes of instruction. Similarly, Cuthrell & Lyon (2007) reported that a variety of instructional strategies needed to be used to motivate a wide range of graduate students in the education discipline.

In one American study, most (63.8%) first year medical students preferred multiple modes of learning when studying medical physiology (Lujan & DiCarlo 2006). In

another investigation into the learning style preference of medical students when studying physiology, 87.5% of males preferred multimodal instruction (specifically, the VARK modes), whereas 54.2% of females preferred single-mode instruction with a preference toward kinaesthetic learning (Wehrwein et al. 2007).

5.6.5.2 Students' perceptions of effectiveness of instruction modes

In response to a questionnaire item on students' perceptions of effectiveness of instruction modes in delivery of science content, students indicated that they found all teaching strategies of value in their learning of science – Table 5.21.

Table 5.21: Student perception of effectiveness of mode of instruction

Instruction mode	Group A **%** (n)	Group B **%** (n)	Group C **%** (n)
"Which method of delivery of the science courses have you found most effective?"			
Year 1	2005	2006	2007
Practical class	**56.9** (95)	**28.4** (60)	**33.0** (89)
PBL	*	*	*
Tutorial	**25.1** (42)	**39.8** (84)	**38.9** (105)
Lecture	**18.0** (30)	**31.8** (67)	**28.1** (76)
Year 2	2006	2007	2008
Practical class	**15.6** (43)	**12.0** (29)	**21.5** (51)
PBL	**22.1** (61)	**29.8** (72)	**30.0** (71)
Tutorial	**23.9** (66)	**23.1** (56)	**23.6** (56)
Lecture	**38.4** (106)	**35.1** (85)	**24.9** (59)
Year 3	2007	2008	2009
Practical class	**11.3** (29)	**18.3** (43)	**15.6** (48)
PBL	**28.8** (74)	**25.9** (61)	**23.5** (72)
Tutorial	**30.7** (79)	**23.0** (54)	**33.9** (104)
Lecture	**29.2** (75)	**32.8** (77)	**27.0** (83)

* PBL was not offered in first year science unit

Comparison of instruction modes found most effective, by gender

First year male nursing students perceived that tutorials and practical sessions in the science units were more effective than lectures, whereas female students found that all the main teaching modes were similar in effectiveness for learning. This is contrary to the preferences of learning modes by medical students studying physiology (see 5.6.5.1 above for study by Wehrwein et al. 2007), indicating that medical and nursing students differ in the way they learn science. Future studies may be directed towards investigating the differences in learning

behavior and study preferences of medical and nursing students, as it may inform best practice in learning and teaching of science in nurse education.

Both genders perceived tutorials to be more effective than other modes – see Figures 5.4 and 5.5. Problem-based learning (PBL) was not offered as a learning mode in first year science units.

Figure 5.4: Instruction mode found most effective by first year male nursing students

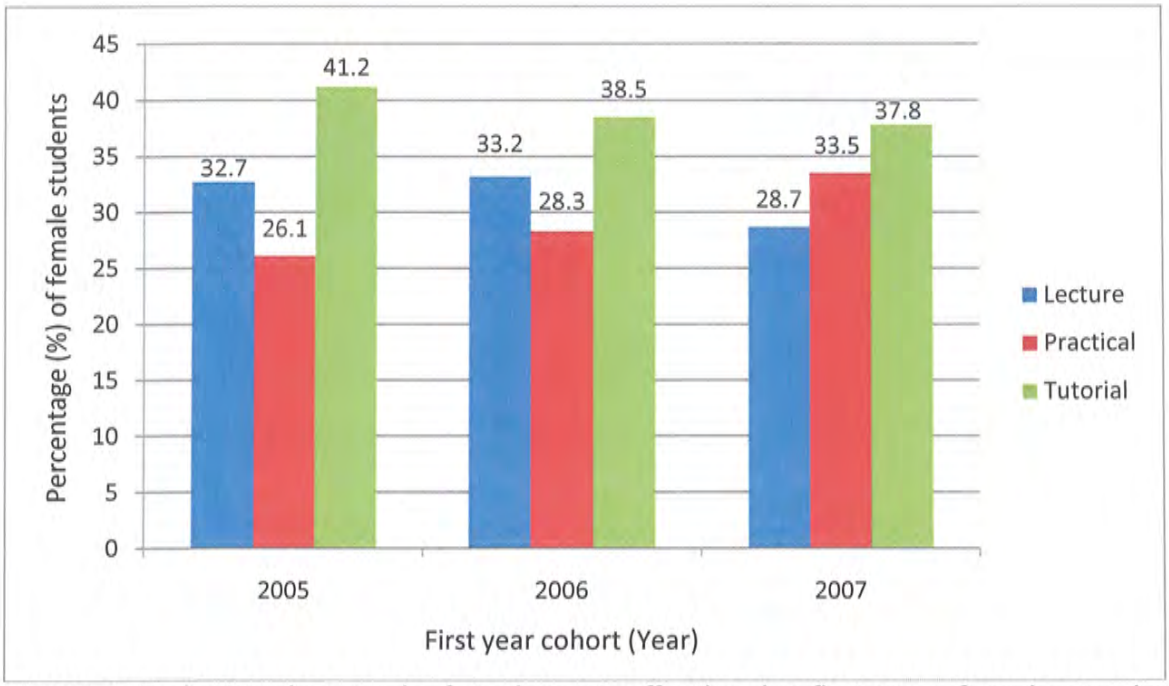


Figure 5.5: Instruction mode found most effective by first year female nursing students

Between the first year cohorts, there was a significant increase (comparison of 2005 and 2007 Yr 1 cohorts: $\chi^2 = 9.633$, df = 1, p = 0.002) in female perception of effectiveness of practical classes. A decreasing trend in proportion of female students finding tutorials effective (p = 0.127) was also noted.

Both, male and female students of Years 2 and 3 stated an approximately equal preference for the PBL classes, tutorial and lectures. Their preferences for these teaching modes were higher than for practical classes (Figures 5.6 and 5.7). This may be accounted for by the fact that the science practical component has no examination as such, so the students concentrate more on PBL and tutorial sessions as they perceive these teaching modes to directly help them in passing the written examination of the science units.

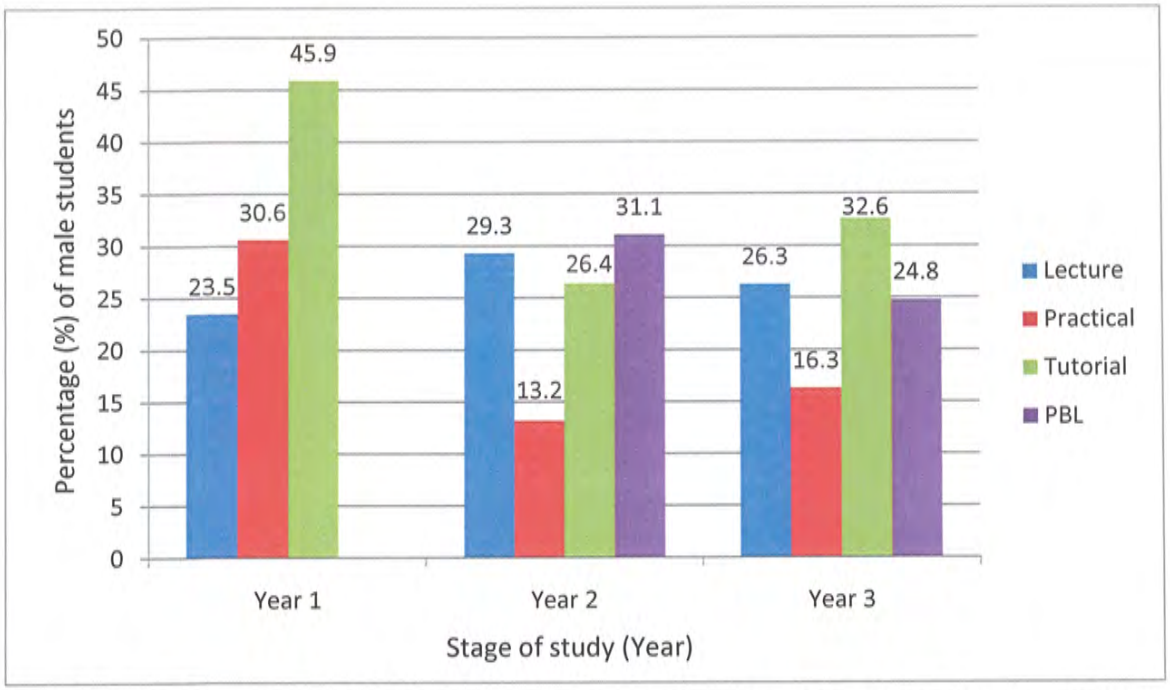


Figure 5.6: Pooled scores of male nursing students' perceptions of effectiveness of instruction modes

Female students had significantly decreasing perception of effectiveness of practical classes in progressing from first year to third year of the BN course (comparison of first year and second year cohorts: $\chi^2 = 21.393$, df = 1, $p < 0.001$) (Figure 5.7).

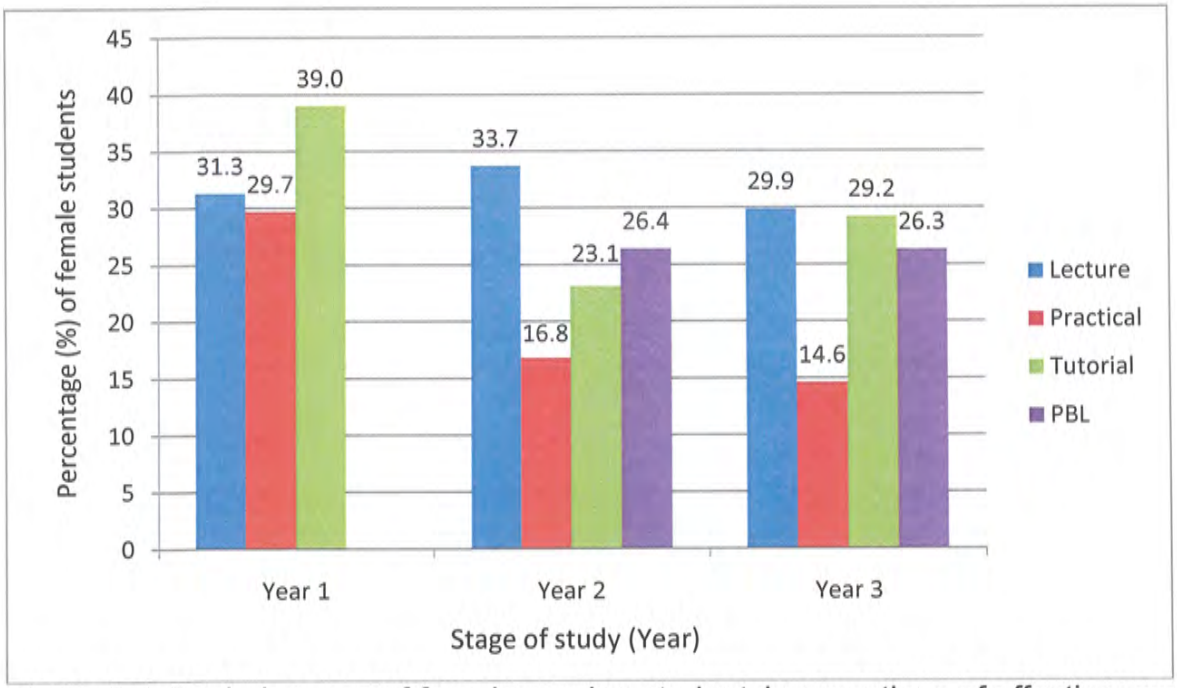


Figure 5.7: Pooled scores of female nursing students' perceptions of effectiveness of instruction modes

Comparison of instruction mode found most effective, by age

In the first year cohorts, both school-leavers (< 20 years age group) and mature-aged (> 20 years) students had similar perceptions of effectiveness of tutorials, lectures and practical classes (Figures 5.8 and 5.9), although mature-aged students consistently perceived tutorials to be the most effective instruction mode – Figure 5.9 (note: Problem-based learning was not offered as a learning mode in first year science units).

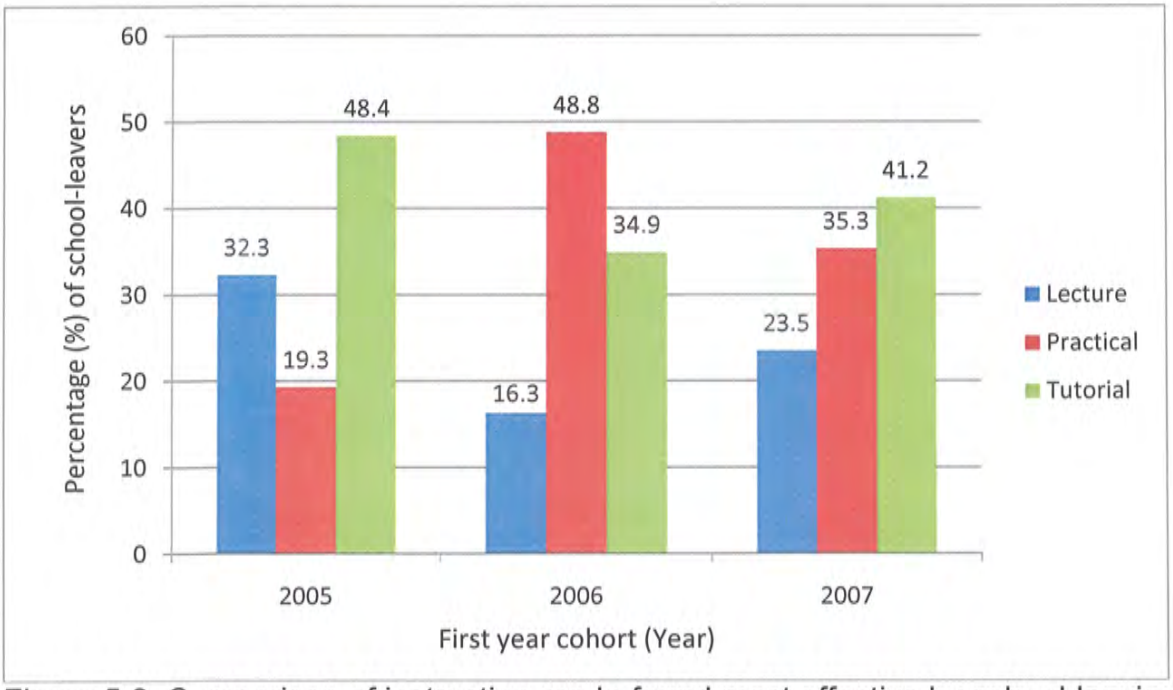


Figure 5.8: Comparison of instruction mode found most effective by school-leaving aged first year nursing students

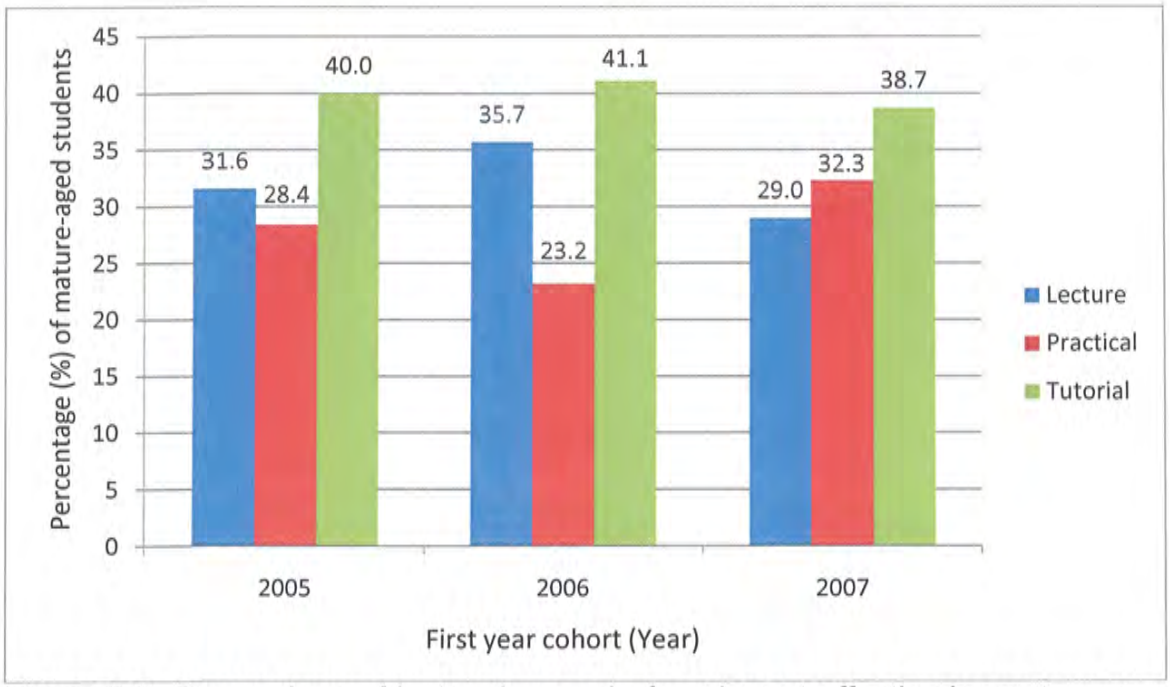


Figure 5.9: Comparison of instruction mode found most effective by mature-aged first year nursing students

Comparison of instruction mode found most effective, by linguistic background

Students' perceived effectiveness of instruction modes with respect to their linguistic backgrounds is shown in Table 5.22. Students from both linguistic backgrounds (ESB and NESB) showed similar perceptions of effectiveness of the main teaching modes.

Table 5.22: Students' perceptions of effectiveness of instruction modes, combined data

	Year 1 cohorts % (n)		Year 2 cohorts % (n)		Year 3 cohorts % (n)	
	ESB	NESB	ESB	NESB	ESB	NESB
Practical class	**31.6** (71)	**28.8** (126)	**12.6** (27)	**20.6** (102)	**8.1** (15)	**18.6** (105)
PBL	*	*	**36.0** (77)	**27.2** (135)	**31.9** (59)	**26.1**(147)
Tutorial	**43.1** (97)	**38.4** (168)	**26.2** (56)	**22.4** (111)	**34.1** (63)	**30.1**(170)
Lecture	**25.3** (57)	**32.7** (143)	**25.2** (54)	**29.8** (148)	**25.9** (48)	**25.2**(142)

ESB: English-speaking background; NESB: non-English speaking background
* PBL not offered in Year 1

Survey results showed that while nursing students differed in their perceptions of effectiveness of the main teaching modes used, the differences were not significant with respect to student gender, age (school-leaver or mature-aged) or linguistic backgrounds (English or other).

Common perceptions amongst students were that the tutorials *"helped to consolidate the knowledge gained from lectures"*, *"the use of a variety of teaching modes integrated their learning well"* and *"that no changes to the structure or teaching of the science units were necessary."* – (taken from focus group transcripts of Years 1, 2 and 3 students).

The experiences of female nursing students generally resembled those of male students in that they, too, found the science content, as expressed in their own words as, *"difficult"* and *"huge"*. This is consistent with the findings of other researchers (Friedel & Treagust 2005; Thalluri et al. 2005) who reported that the female students were also struggling with the science component of nursing. Many commencing nursing students found the adjustment to university life and the study required in science units difficult, as indicated by significant failure rates in these units (Robinson et al. 2010).

Male students' perceptions of their progress were not necessarily correct. In 2006, 23 participating male students of first year cohort responded to a questionnaire item "What grade do you realistically hope to obtain in the science units?" Their responses were: Pass (3), Credit (10), Distinction (7) and High Distinction (3). None of the male students indicated that they were struggling in the course and expected to fail the unit. However, according to the student performance data for that unit, the failure rate for the total of 53 male students in that cohort was 43% (23) compared to 17.0% (61) for the 304 females. Hence, student perceptions may be misleading. The failing male students obviously had high expectations, perhaps were not committed enough to study or had an inefficient study approach.

The data supports the value and appropriateness of all four learning experiences in the delivery of science units. However, there was some variation in students' learning preferences. These variations of teaching modes may be attributed to various factors such as the topic being learnt, which academic lecturer was leading the session and how the material was presented (speech only, PowerPoint presentation, scenario-based teaching, and informal group discussion). Students were adamant that all four strategies should be maintained even if additional strategies such as self-directed learning (SDL) and online

learning were to be added in science units. The lecture remains a popular teaching strategy in tertiary education, capable of quickly introducing key concepts to a large group (Matheson 2008). Lectures identify key facts and concepts for further study. Other benefits of lectures include personal approach of lecturer and set environment (Domizio 2008). However there is a risk that this didactic model will only promote superficial learning as students may become bored and disengaged, absorbing some of the content only and remembering even less. Other drawbacks with the lecture format are that students are reluctant to ask questions in large groups and there is insufficient opportunity for ascertaining student understanding.

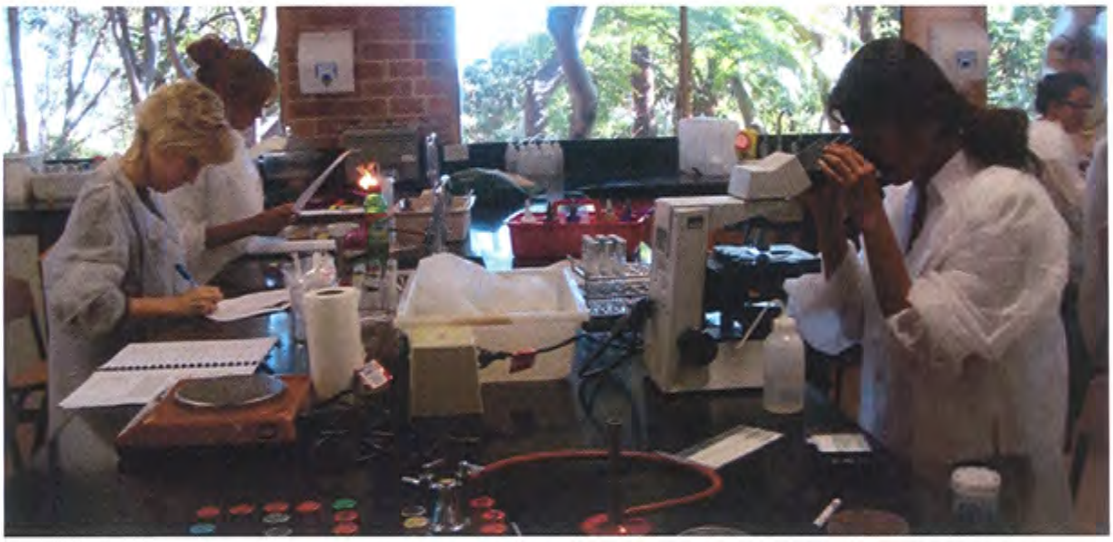
In this study, many nursing students preferred the lecture as a learning mode because the lectures *"introduce the topic and gives structure to students' reading"* and *"indicate the depth of reading and knowledge required for the topic"*; *"the lecturer motivates and engages students and becomes an inspirational role-model"* (information derived from personal discussions with students). Tutorials are popular because *"once the context for the topic is set by the lecture(s), the key points are covered in detail in the tutorial"* (student comment taken from Year 2 focus group transcript). Students find PBL sessions effective because PBL *"promotes critical thinking skills"* and *"helps to directly link science theory to clinical practice"* (Year 3 focus group transcript). The teaching of science can remain relevant, dynamic and effective through multi-modal learning and teaching. This is indicated by student comments:

> *"The collective use of all* [teaching] *modes is effective in learning science."*
>
> *"keep lectures, tutorials, PBL and practical classes in science units, no need to change anything..."* (Third year focus group transcripts).

Pedagogic theory has changed significantly in recent years, resulting in a shift away from didactic lecture-based teaching towards small group problem-based learning (PBL) (Staun et al. 2010; Domizio 2008; Smith & Coleman 2008) and inquiry-based learning (IBL) (Bebb & Pittam 2004) in many tertiary institutions. The concept of PBL and other inquiry-based learning models as a student-centred

learning methodology, has gained momentum in nurse education as it has been shown to stimulate development of higher order intellectual skills and abilities as well as lifelong learning skills (Wells et al. 2009; Smith & Coleman 2008). Tutorials and PBL sessions are teaching modes that promote "active", or "deep" learning (Baker 2000; Entwistle 1997). These formats are ideal for teaching small groups (Wells et al. 2009). A PBL session is different from a tutorial in that it is an interactive, scenario-based teaching approach where a situation or "problem" is presented for discussion. PBL is considered effective because adults are motivated to learn when practical problems are identified (Matthews-Smith et al. 2001; Knowles 1990, cited in Davies et al. 2000). The nature of client care is often complex and more demanding in the 21st century, which necessitates the need for nurses who are capable of thinking critically to respond to and initiate change, and competent to work interprofessionally (Smith & Coleman 2008; Amaro et al. 2006; Friedel & Treagust 2005).

As nursing is a practice-based profession, practical laboratory classes are favoured by many nursing students, more so by those who are kinesthetic learners, who learn through touching and experiences that emphasise doing, physical involvement, and manipulation of objects (Lujan & DiCarlo 2006). Photograph 5.4 shows nursing students in a science practical laboratory class.



Photograph 5.4: First year nursing students in a science laboratory
(Photograph used with students' permission)

Students become used to the 50 minute sessions (lectures, tutorial and PBL classes). Both male and female students showed low preference for practical classes, possibly because it is the only instruction mode that was double the time. Having to concentrate on science practical laboratory session for approximately two hours was challenging for many students. It is possible that in some cases, students' perception of effectiveness of a particular learning mode is influenced by factors such as availability of lecture and other class notes on the LMS, and whether attendance at certain classes was mandatory. For instance, some nursing students attended most of the practical, PBL and tutorial classes but not lectures, where attendance was not recorded. Both male and female students skip lectures and other classes due to various reasons, including work commitments and parenting obligations. Female students tend to have a larger network of student contacts from whom to catch up on the missed work compared to the male students who may have had fewer social contacts within their cohort.

5.6.6 Students' learning approaches in the science units

First year nursing students quickly realised the importance of developing a study plan and maintaining a consistent effort. A proactive approach taken by some students is indicated by statements like:

> *"I use textbooks to supplement my notes, I also ask questions in class."*
>
> *"I record lectures and later repeatedly listen so I get all the detailed information."*
>
> *"Preparing for class presentation and other group work boosted my confidence in medical speaking and will help in nursing practice."*

Some of the adaptations or changes made by the first year BN students to improve their study skills include reducing social and leisure activities such as watching television and playing sports, and spending more time on study and revision. Second year students made the most of studying in small, self-formed groups because *"it made learning fun and easy"*; this learning approach occurred in class, in between classes, in the library, off-campus, or whenever and wherever opportunity arose. Their opinions on adaptations and study approaches included the following comments:

"The main adaptations needed are more commitment to study, more planning, more effort, more focus, persistence and enthusiasm. Need to study harder and develop good exam technique."

"The sooner you get organised and manage time, it does become easier."

"There is a need for improvement to the adaptations we made before."

"We have to cope somehow. Planning is very important and improving the overall outcome by keeping a positive attitude and persistence."

"It's important to maintain interest, and make time available for study."

Students tended to become increasingly committed to study, adaptations being made at a personal level included making best possible use of time, as this student reports:

"I found that waking up early to revise was better for me than staying up late. That way, I was able to learn and remember more."

By the third year, students had tried and tested different study tactics and felt that they were more confident and prepared for the final science unit. Study techniques that the students found useful were adopting a critical approach of *"self-questioning and wider reading"*, *"drawing lots of diagrams and learning from pictures"*, and *"studying together with friends"*. The formation of learning communities is an effective strategy for the students because they learn well from group discussions, and the team effort also reduces stress for each individual.

"I changed the way I studied science. I used to go through text-books and learn myself but, now, it's much easier with group study. I actually feel that I understand concepts better now."

Other effective learning strategies range from reading all course notes and textbooks (including preliminary reading before class), writing short summary notes as dot points, and practicing past exam questions (data from third year focus group discussions).

5.7 Students repeating a science unit

5.7.1 Winter School

An intensive short course in the form of a "Winter School" was organised in inter-semester break (June 2007) for students who had failed a second year science unit. This three week Winter School was attended by 12 students. The group consisted mostly of overseas-born students in the 20-30 age group; and ten out of the twelve students spoke English as a second language. The gender ratio was one male to three females.

At the commencement of the course a focus group discussion with these students was held. In the focus group discussion, 10 students were asked the following three questions:

"Why do you think you failed the science unit?"
"What could have prevented you from failing?"
"How can we help you to pass science-based units?"

Subsequently, one-to-one interviews were also held with three students separately. A further questionnaire survey was conducted a day before the examination. The brief questionnaire that was used to survey the Winter School students is given in Appendix E.

5.7.2 Demographic information of students repeating a second year science unit

Demographic details about second year students attending the Winter School science unit is shown in Table 5.23.

Table 5.23: Demographic information of students attending Winter School

Students (n)	Country of birth	First language	Age group	Gender
5	China	Cantonese	20-30	4 females, 1 male
1	Taiwan	Mandarin	20-30	female
2	Philippines	Filipino	20-30	1 female, 1 male
1	Estonia	Russian	20-30	male
1	Equador	Spanish	>30	female
1	Germany	English	20-30	female
1	Australia	English	20-30	female

A questionnaire item (permitting multiple responses) sought cause(s) of student difficulties in managing study. Students' responses are summarised in Figure 5.10.

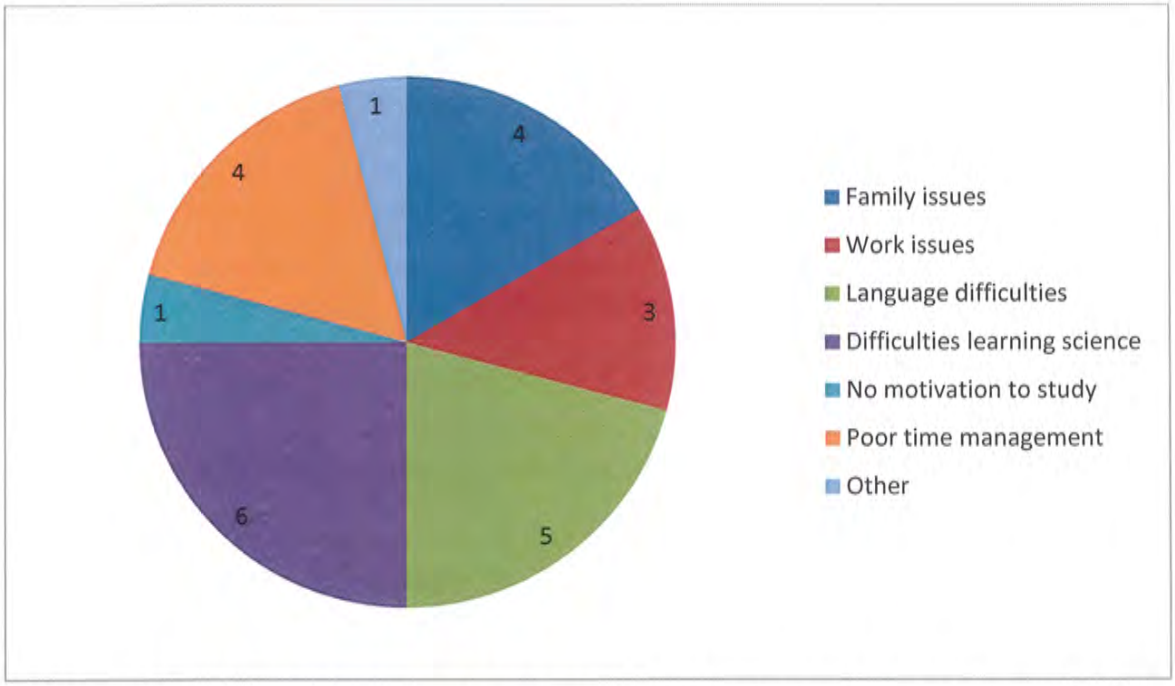


Figure 5.10: Students' reasons for experiencing hardship in their first attempt at a second year science unit

Students' main reasons for failing their first attempt at the second year science unit were: *"difficulties learning science"*, *"problems learning in English language"* for the overseas-born students, *"poor time management"* and *"family issues"*. The

"other" reason indicated by one student was financial hardship. This was the same student who also gave the response *"no motivation to study"*; free-text comments were: *"Financial issues → stress from outside factors. No incentive to study, so not enough motivation"*.

In the focus group discussion, students' opinions were sought as to the reason that they had failed the second year science unit in their first attempt. Their responses included:

"Family commitments and personal issues to be settled."

"Family commitments so I couldn't turn up for major assignments."

"Poor attendance and not handing in my major assignments."

"Not enough study. Didn't put much effort into it."

Students' level of commitment to paid work and study during normal semester were analysed and compared – the results are summarised in Table 5.24. It is evident from the survey information in Table 5.24 that nine out of the twelve students were engaged in paid employment in areas not related to healthcare. Three students who did not work for pay did not commit much time to study when off-campus. Each of the twelve students had repeated at least one science unit in the past, and many had also repeated a non-science unit. These students had a poor academic history, and needed to allocate more hours to effective study. Students who were inefficient in study or who had poor literacy in English language were most likely to benefit from academic and peer support in improving their learning (including academic writing) skills and proficiency in English language.

Table 5.24: Summary of students' levels of commitment to paid work, off-campus study and their academic history

Student no.	Working for pay h/wk	Study at home h/wk	Academic history
1	0	8-14	Repeated a science unit once Repeated a non-science unit once
2	8-14*	15-21	Repeated a science unit twice
3	22-35*	1-7	Repeated a science unit once Repeated a non-science unit twice Deferred exams twice
4	0	1-7	Repeated a science unit once Deferred exams twice
5	8-14*	1-7	Repeated a science unit once
6	0	15-21	Repeated a science unit once Repeated a non-science unit once
7	15-21*	1-7	Repeated a science unit once Repeated a non-science unit once
8	8-14*	8-14	Repeated a science unit twice Repeated a non-science unit twice
9	15-21*	15-21	Repeated a science unit once Repeated a non-science unit once
10	8-14*	15-21	Repeated a science unit once Repeated a non-science unit once
11	22-35*	15-21	Repeated a science unit once Repeated a non-science unit once
12	22-35*	1-7	Repeated a science unit once Repeated a non-science unit twice

*Students engaged in paid employment indicated that they were not working in a health-related area.

In response to: "What could have prevented you from failing the first attempt?" one student summed it up well for the group by the response: *"Studying more and understanding the questions"*. Students' responses when asked "How can we help

you to pass science-based units?" (from focus group discussion transcript) included:

"We need to manage time better and be more committed in their study."

"We could benefit if we have more revision classes [including spot tests in practical classes] *before assessments."*

In response to the questionnaire item "Do you think you will pass this Winter School unit?", five students indicated that they were confident. Their free-text comments included:

"I am attending and submitting assignments regularly this time."

"Better structure of this short course means that I'm actually studying more and understanding more."

"For each of the 3 weeks, what we learnt during the week was examined at the end of the week – so it was easier to understand and remember. It kept us focused."

"It's good that there is no major oral presentation this time."

Four students expressed uncertainty, and three gave a negative response such as:

"Too much content in the intensive course, very tiring."

Students' responses to the questionnaire item "Which of the following strategies would help you to study science units?" (permitting multiple responses) are summarised in Figure 5.11. The learning strategies that the students found most helpful were reading all course notes, forming study groups, and practising past examination questions; whereas the least popular study strategies were reading text-books and asking questions during class.

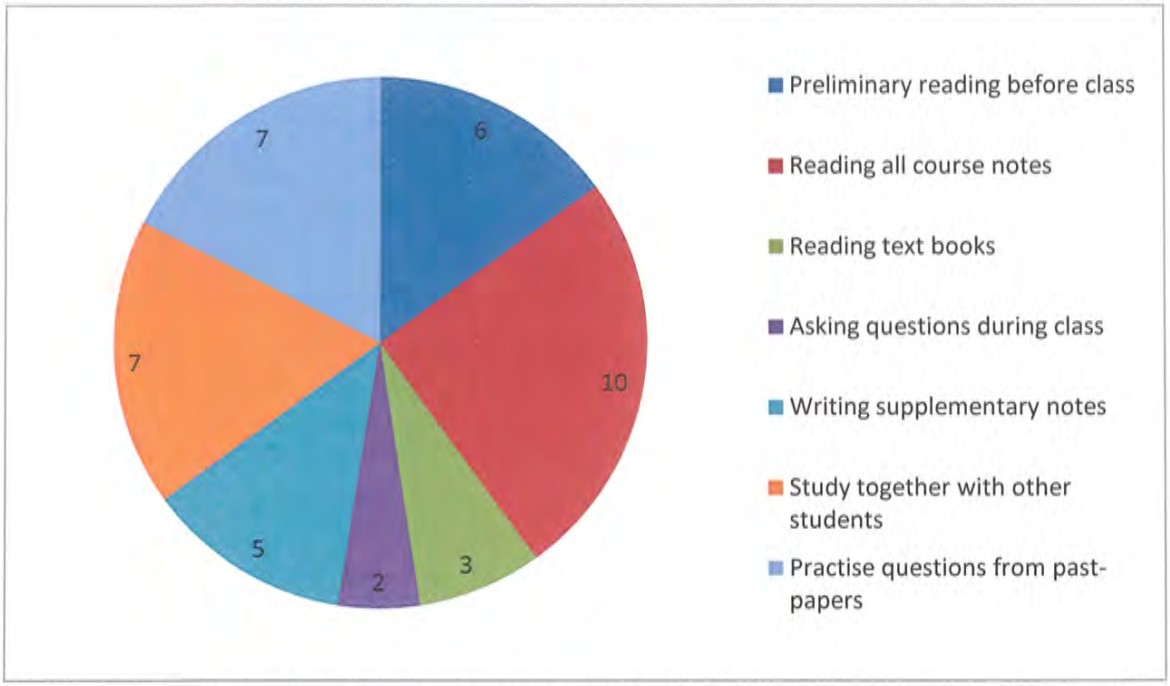


Figure 5.11: Strategies perceived by students as helpful in study of science units

In a one-to-one interview, a student attending Winter School disclosed that he "*only relied on course notes*", without using text-books to supplement learning. Another student admitted that his notes were incomplete because of repeated *"absences from classes"*. These statements are in contrast to those given by a few successful Year 3 students, such as:

> *"I have never failed a science unit because I routinely use a range of effective study habits such as extensive reading, writing concise notes, and summarising key concepts as dot points."* (taken from Year 3 focus group discussion transcript).

Students who are capable of maintaining a proactive study approach are likely to be in control of their learning in the science units (Thalluri et al. 2005). Students who are orientated to study and have developed effective learning approaches are academically successful (Mehta et al. 2008, Mansouri et al. 2006; Andrew & Vialle 1998).

5.8 Student experiences

5.8.1 Male and female students' experiences of the BN study

In the questionnaire surveys, students tended to report negative experiences; very few students stated positive experiences (such as of satisfaction with the science unit). A commonly stated experience of some male and female students was that they lacked preparedness for academic study, and found it stressful to cope with the higher than expected academic demands of the BN course. First year students stated that the pressures of tertiary study were realised as early as in the beginning couple of weeks of the first semester. There were additional pressures for some students, especially those international nursing students from culturally and linguistically diverse (CALD) backgrounds, who struggled with learning in English as a second language and with scientific terminology. Approximately 38% of students commenced their studies with limited exposure to science education. Many first year students needed to adopt a stringent study discipline and develop effective learning skills (Mehta et al. 2008). Other pressures included conflicting priorities as students struggled to juggle study, work, family and social obligations.

One-to-one student interviews revealed that some students experienced uneasiness, anxiety and stress. Some commencing students found themselves in a new context - away from the family, close friends and support systems. They felt uneasy with these rapid changes. They found themselves removed from their usual comfort zone. They realised that they would be spending a long time in the new learning environment, and felt uncertain about their preparedness for the immediate and distant future. They found the pace of course delivery *"too fast"* and the content *"too much"* to understand and remember for assessments. Apart from the study overload, they felt a sense of inadequacy (perceived failure to meet the expectations of the course), self-doubt about personal abilities and learning skills to cope with studies at a tertiary level, and low self-esteem (a sense of personal insufficiency, therefore lack of self-respect). Other causes of stress and depression included incidental events, which were life events or situations such as the break-up of relationships, the need to find work to pay for expenses incurred while studying, or to financially support a relative. Having to adjust to unexpected or sudden changes in life situations during the difficult time of transition to university also contributed to student anxiety, stress and depression.

5.8.2 Specific experiences and concerns of some male nursing students

Two male students (in the first year) disclosed that they were concerned about assumptions that people might make about their sexual orientation (data from one-to-one interviews). This finding is supported by reports in literature. In Australian nursing programs, the educational experiences of males differed significantly from females (Dyck et al. 2009; Harding 2009, 2008; Anthony 2004). Some males encountered role stereotyping and gender bias through the assumption of stereotypical notions of caring in nursing (Harding 2009; Kermode 2006). According to Grady et al. (2008), men in nursing are significantly more affected by the perceived prevalence of sexism and gender discrimination than women students. There is a paradox between widespread calls for men to participate more in caring and discourses which stereotype male nurses as homosexual (Harding 2007). Although a majority of male nurses may be heterosexual, the stereotype persists and creates homophobia in the workplace and deters men's entry into the profession (Harding 2008). In a report entitled "Where are all the male nurses?" (Anonymous 2001), it is stated "the main reason men were not entering nursing was not because of poor pay, shift work or a lack of career advancement but because they fear being branded as homosexual by their peers and families" (p. 35). A number of researchers maintain that it may be a significant factor that deters men from the profession (Armstrong 2002; Isaacs & Poole 1996). However, sexual orientation is not relevant to nursing ability, as there are higher numbers of men in medicine which also involves caring.

Male students faced particular challenges during their university experience. Initially, many were uncomfortable at being a minority within the cohort. Some felt isolated and excluded from an academic and clinical perspective. This is consistent with the findings of other researchers (Andrew et al. 2008; Stott 2007, 2004). There are times when some patients may refuse to be cared for by a student male nurse on clinical placement. Although it has been reported that the public is generally displaying an increasing respect and acceptance of male nurses (Saritas et al. 2009; Lo & Brown 1999), more should be done at a student level to foster this equality. Chan [overseas-born, Australian citizen, Year 3 student at ACU (NSW)] raises concern that:

"It is humiliating when female patients refuse care by us male nurses – it limits our clinical experiences. I always take a practical approach to work. In my science lab[oratory] *classes, I have enjoyed dissections and other practical activities. There's a bit of gender bias in practical work at uni but it's really nothing compared to what I've seen in the wards. I'm sure that many male nurses can be just as caring and capable as most female nurses. Although I do accept that a patient's request for care by a male or female nurse should be met as much as possible, it would be great if male nurses are trained in such a way, or to such an extent, that patients' would have no hesitation in accepting their services."*

The student alluded to gender bias in university laboratory classes but did not disclose any specific details, probably accepting that it was normal in a cohort dominated by female students. For some quiet male students, it took a lot of adjusting to fit into a study environment dominated by females. Sample statements indicating this theme came from first year focus group discussions; for example, one student stated:

"Being an international student, I often felt isolated, lonely and uncomfortable in class, particularly in the practical lab where I was the only male student."

The above statement implies that the student was able to conceal his loneliness in a lecture theatre but found practical sessions amongst female students rather confronting. Some students were very appreciative of the academic support available, as indicated by the following student statement:

"Full-time uni and part-time work meant that I had no social life. At times, I nearly gave in to the pressures of study and assignments, but there was always one or the other lecturer who came to the rescue giving encouragement. From then on, I'm glad that I've come a long way and there's no turning back."

Despite feeling lonely and vulnerable in practical and theory classes, and stressful early clinical experiences, male students' initial fears were overcome by further clinical practice (Photograph 5.5) - as indicated by this sentiment:

"In my two clinical placements, I felt very uncomfortable, very unsure of how I would handle the work in a clinical setting. But it wasn't as bad as I expected. In fact I'm beginning to like it very much. I get a sense of satisfaction after tactfully handling a patient-care situation. I have begun to see and appreciate more of the hidden side of me as I communicate more with the patients."
(Taken from third year focus group transcript).

Photograph 5.5: Male nursing student acquiring clinical practice experience
(Photograph taken with students' permission)

One-to-one interviews revealed information about students' expectations of more male role models among academic staff and on their clinical placement experiences.

Male students' specific needs and expectations require consideration. A complex interplay of the factors discussed in the preceding paragraphs account for worries and stress in male students. These factors have the potential to hinder learning and adversely affect academic performance and achievement. Therefore it is imperative that academic and other university staff detect and resolve such issues as early as possible to increase retention of male students and improve their performance. Increased knowledge of students' perceptions, preferences, experiences, sensitivity to social justice issues and specific concerns may influence the development and delivery of the Bachelor of Nursing (BN) course congruent with the learning needs of male students.

Recently, very few local male school-leavers have been attracted into nursing. It is of concern that Australian male school-leavers are not opting for nursing as a first

career choice. Nursing is seen as women's work and is not valued as highly as other professions, which is another reason why young men do not choose nursing as a first career choice. Strategies should to be implemented to make BN courses more attractive to young males. A way forward to attract and retain more males into nursing programs would be to increase awareness among high school students of nursing as an occupation suitable for both genders and a profession that offers job security and opportunities for specialisation in many areas of clinical practice. This information should include talks presented by role models who reflect the diversity and complexity of the nursing world, so that students gain a realistic and balanced perception of nursing.

Recruitment of male students into nursing education, in the 20-30 year age group, should continue as they are likely to have had varied educational and work experience, have a partner and young children, and be more ambitious or committed to a stable nursing career and income than students in the younger age group.

5.8.3 Attrition of male students from nursing courses

A minority of men enter nursing, although the numbers are increasing (Dyck et al. 2009; Grady et al. 2006; Stott 2004). However, retention of males in nursing courses continues to be problematic as their attrition rate is high. Attrition statistics for Bachelor of Nursing (BN) courses in Australia are similar to those for the UK, USA and Canada (Andrew et al. 2008). Over the last two decades worldwide, there has been a large variation in reported attrition rates (7-55%) from nursing courses (Gaynor et al. 2008; BBC News 2006; Pearce 2004). Attrition from undergraduate nursing courses at Australian universities within the first year is reported as 25-27% (Gaynor et al. 2008). At an Australian regional university, attrition of male nursing students reached 55% and that of female students 45% (Wilson 2005). Factors reported as "hindering" continuation in the nursing course included low self-confidence and being fearful and apprehensive about their ability to complete the degree, as many had been away from study for a considerable amount of time (Wilson 2005). In addition, some male students encountered problems integrating into a predominantly female cohort (Harding 2008).

5.8.4 Men's clinical career pathways

Gender balance is being achieved in various professions with numbers of females in traditionally male dominated professions such as medicine, law and engineering increasing (Dyck et al. 2009; Kermode 2006). However, despite the improvement in gender balance in other health professions, men remain in a minority in nursing.

Since World War II, there have been advertising campaigns in countries such as Canada, USA and Britain that aim to attract men into the nursing profession. Some of these advertisements depicted male nurses as "macho" and technologically capable (Evans 2004). However, few men consider nursing as an option during their school years and are more likely to enter the profession later in life (Armstrong 2002). It has been suggested that men's entry into nursing may be low due to poor pay (Meadus 2000). Feminisation of the nursing curriculum may contribute to the on-going problem of gender imbalance (Kerdmore 2006; Anthony 2004).

Nursing is reputed as a caring profession and continues to attract women into the field (Harding 2009; Price 2009; Evans 2004; Holroyd et al. 2002). In Australia, nursing is statistically dominated by women. In 2007, females comprised 90% of employed nurses, and the total number of registered and enrolled nurses was 305,834 – this is an increase of 12% since 2003 (AIHW 2009). The over-representation of women in nursing in Australia has been seen as an issue associated with gender inequality (Huppatz 2006). The nursing profession is generally perceived as women's work because it is stereotyped as having the traditionally feminine traits of nurturing, caring and support (Brown 2009; Price 2009; Romem & Anson 2005; Evans 2004; Holroyd et al. 2002). This contrasts with the perceived male traits of strength, dominance and aggression (Brown 2009, Price 2009; Harding 2008; Evans 2004). The gender role has been recognised as a strong influence on an individual's self-identification as a nurse (MacIntosh 2003). Grady et al. (2008) reported that male nursing students may feel the need to work harder at caring, whereas female students tend to view it as something innate.

Increased awareness of male students' perceptions, preferences, sensitivity to social justice issues and specific concerns may influence the development and delivery of the Bachelor of Nursing (BN) course. This may encourage more males to become and remain in nursing. In a world of equal opportunity, nursing should become more gender neutral.

5.9 Chapter review

Increasing nursing enrolments at ACU (NSW) have resulted in heterogeneous cohorts with diverse learning needs. Many nursing students found the transition to university challenging and realised that the amount of effort and time required in studies, particularly the science units, was much higher than they had originally expected. Students who were not committed enough to study or who lacked effective learning skills failed the science units.

The educational experiences of males differed from those of female students. For some quiet male students, it took a lot of adjusting to fit into a study environment dominated by females; they felt isolated, lonely, and vulnerable, particularly in the first year practical classes and in early clinical experiences. A few who were task-oriented found that they needed to develop their caring skills. Male students tended to group themselves in the same tutorial and practical classes in the second and third year and found it easier to manage their studies.

During the progression of the BN course, most male and female students had a high regard for science, perceiving it to be interesting, relevant to nursing practice and important for medical advances. In progressing through the course, some students' perceptions of science changed from "boring and difficult" to "interesting, relevant and manageable". Nursing students across all stages (Years 1, 2 and 3) of their pre-registration education attached much value to the science component of nursing studies. Increasing numbers of male and female students perceived that there was "not enough science" in the science units. A minority of first year students had a negative perception of integration of science and clinical units - these were mostly female students in the age group 20-30 years, of NESB. Students' perception of learning science changes upon progressing through the BN course: especially women from NESB, who initially struggle with learning

science possibly due to difficulties with English language and scientific terminology, learn to value science and realise the integration of science and clinical units.

There were increasing trends in the proportions of students who stated that they attended workshops for improving academic and communication skills. Many students, particularly from CALD backgrounds, believed that progress in English language would benefit their undergraduate studies. An increasing trend was also noted in the percentages of students using other campus facilities such as the university campus library. Students with poor time management and study skills benefited from academic and peer support. Nursing students realised the importance of good study habits such as regular attendance at classes and the implementation of a study plan. Most were able to develop effective learning strategies such as preliminary reading before classes, forming study groups (learning community), reading all course notes and writing supplementary /summary notes as dot points, and practising past examination questions.

Nursing students expressed relatively similar preferences for the main teaching modes used and found collective use of the different teaching modes effective in their learning of science. Students across all stages found scenario-based (such as problem-based learning) and interactive classes very useful in their learning of nursing science, while preference for practical laboratory classes decreased in the second and third years. Although there are individual preferences for a particular modality of instruction, most students adapt well to other modalities. Students across all stages generally valued science components of nursing studies despite sometimes considering the material difficult. Students were not in favour of any major changes in the way science was taught. This suggests that the teaching of science should remain well-embedded throughout the nursing curriculum.

A gender-balanced nursing model, both for the student and patient, is desirable in promoting social justice and meeting the high level of healthcare service expected by today's society.

Chapter 6

General Discussion and Conclusions

Chapter 6: General Discussion and Conclusions

6.1 Introduction and overview

In the past decade, enrolment in the science units of Bachelor of Nursing program at the Australian Catholic University (Sydney) has more than tripled. This has resulted in diversification of the student population, with increasing numbers of international, mature-aged, and male students enrolling into the nursing program. In addition, technology has drastically changed the learning environment for the net generation. Science is an important component of nurse education. However, undergraduate nursing students often encounter difficulties in learning science. This is a complex, mixed methods study utilising both, quantitative and qualitative data. As described in the preceding chapters this thesis

- investigated the composition of tertiary undergraduate nursing student cohorts in the early 21st Century;
- expanded awareness of the 21st Century nursing students' academic expectations, perceptions and experiences of learning science;
- examined undergraduate BN students' study behaviours and how they changed over the duration of the course;
- identified problems and challenges that large cohorts of undergraduate nursing students faced as a consequence of the rapid unplanned changes due to the sudden expansion in the BN course;
- examined the effects of factors such as gender, age, and ethnic background on learning strategies and trends in students' expectations, perceptions and experiences of the BN and, in particular, of learning science;
- analysed students' perceptions and values, particularly of the science content, over the duration of the BN course.

This chapter shows how the aims of this investigation were met. A discussion of the implications of these findings for policy and practice is then provided. The limitations of the research are acknowledged and discussed including the role of the researcher. Recommendations for future research are made.

6.2 General discussion

6.2.1 Study design

The horizontal and longitudinal mixed methods research design was selected to investigate students' learning experiences as they progressed through the science units in the first, second and third year of the BN degree. In a complex study where students have diverse and changing perceptions, expectations and learning experiences, a combination of horizontal and longitudinal mixed methods approaches was considered particularly useful to expand opportunities for data collection and give students a voice. The chosen methodology provided students with opportunities to directly participate in surveys or voice their concerns in small group and individual discussions. The qualitative descriptive research was a 'naturalistic inquiry' with a commitment to studying something (particularly students' perceptions and experiences of science education) in its natural state (Sandelowski 2000). Open-ended questions were used in surveys and in discussions with students to obtain a deeper understanding of students' learning experiences.

During the period of data collection for this study, the investigator was primarily exposed to the students in the capacity of a full-time lecturer in the science units of study in the BN. The researcher's experiences as a teacher augmented the information that was obtained as a researcher. Students participating in the research seemed appreciative of the surveys as an opportunity to state their views and concerns. The investigator's observations formed as a lecturer in several units of study helped to direct the qualitative phases of the research; the experiences of being an academic served to inform and develop the research. It was only at the time of qualitative data collection (focus group discussion or one-to-one interview) that the respondents became more aware of the investigator's role as a researcher. At such times, the researcher always attempted to simply ask open-ended questions and take notes. Fully aware of the view held by Spano (2005) that the 'observer effects' ('researcher effect', also referred to as the Hawthorne effect) may bias research findings, the researcher was careful to minimise bias while asking questions, recording answers and interpreting the qualitative information. It is acknowledged that there may have been some observer effect in student responses given that the researcher was also a lecturer.

However, observations can and do generate important data and critical insights. Informants' responses to the researcher provide important data that reveal significant information about the population being studied. In attempting to minimise the 'observer effects', researchers may be restricting their access to rich data in the field since some of the greatest strengths of qualitative focus group research lie in cultivating close ties with the sample population and dispelling the illusion that robust data are best achieved through distance (Monahan & Fisher 2010). Through close proximity to and interaction with informants, the researcher sees first-hand how meanings emerge through talk and collective action, and how understandings and interpretations change over time (Emerson et al. 1995).

6.2.2 Composition of tertiary undergraduate nursing cohorts

The composition of the students at ACU (NSW) was studied by analysing the demography of three successive cohorts each of first, second and third year BN students. In the 2005-2007 horizontal study, it became obvious that the nursing student population at ACU (NSW) was heterogeneous as up to 55% of first year cohorts were international students from Asian and other countries, more than 80% were mature-aged students with different life experiences, and only 16% were male students. Most international students came to ACU (NSW) to study nursing from Asian countries such as China and South Korea, Nepal, Japan, and Philippines. Small numbers were from countries such as India, Ghana, Kenya, Zimbabwe, and European countries. Graduating international students is beneficial in terms of catering to the healthcare needs of ethnic minority groups in Australia and elsewhere. The ethnic groups in Australia comprise 92% white, 7% Asian, and 1% Aboriginal and other (CIA 2011). Healthcare needs for ethnic minority groups are often not adequately accommodated due to problems of cultural insensitivity among healthcare personnel in caring for ethnic clients (Dragon 2009; Pacquiao 2007; Rossiter & Yam 1998), and communication difficulties between ethnic clients and nursing staff (Salamonson et al. 2010; Klisch 2000; Shakya & Horsfall 2000).

The number of mature-aged students, who returned to formal study after a break of between 1 and 30 years, continues to remain high. Students often return to higher education after financial stability, settling in own home, having children, or

for other reasons such as career change and up-skilling for a better, more secure job. The fact that students are entering nursing later in life raises certain questions: should there be increased measures to attract more school-leavers? Or is it better that students enter nursing after acquisition of maturity, stability, life experiences and development of qualities such as patience, compassion and empathy? After qualifying as a nurse, school-leavers may seek a career change for better pay whereas mature-aged students tend to remain in nursing, although they have a shorter working career than school-leavers (Drury et al. 2009). Another important finding is that increasing numbers of males are embarking upon nursing education, and that students are more accepting of nursing as a career suitable for both genders.

This study identified that nursing was a more popular career choice among female students than males, which is consistent with the findings reported by Tzeng et al. (2009). 21.0% of female students and 17.6% of males commencing first year of the BN course at ACU (NSW) were school-leavers. In Australia, it is not uncommon for school-leavers to take at least a year off from studies after high-school. The proportion of commencing mature-aged males in the first year cohorts (of 2005 to 2007) was higher (82.4%) than females (79.0%). This suggests that more female students, of school-leaving age and mature-age, chose nursing as a first career choice than male students. This supports the findings of other researchers (Muldoon & Reilly 2003; Marsland et al. 1996). A greater proportion of mature-aged (>21 years) students compared to school-leavers (< 20 years) were attracted to nursing because of its reputation as a skilled profession (15.0% mature-aged students, 8.7% school-leavers) – this is consistent with the findings of other researchers (Drury et al. 2009; Vanhanen & Janhonen 2000).

Although the majority of students commencing nursing education were mature-aged, there was no difference between school-leavers and mature-aged students in the qualities required for being a nursing student. Students in both age groups had altruistic inclinations, compassionate and caring natures, realised the importance of science and technology in nursing practice, and were capable of study. Regardless of age, which is a continuum, many nursing students have a potential to cultivate higher level skills of critical analysis that is so important in the

delivery of holistic, evidence-based care (Jasmine 2009; Walker 2006; Darbyshire 1999).

In several studies (McMillan 2007; Salamonson & Andrew 2006; Shakya & Horsfall 2000), there is a focus on countries of origin and differences between students. However, focusing on differences confirms their existence, but does not lead to solutions. Much can be learnt about emerging issues, students' concerns and their learning needs from analysing similarities within diverse student cohorts rather than from focusing on differences. Commonalities come about as students interact while learning, and conform to the requirements and expectations of the nursing program.

6.2.3 Students' reasons for choosing a nursing career

In the recent and current economic climate, as jobs are becoming more difficult to find, this study reports that nursing was a first career choice for 62.4% of commencing student participants during 2005 to 2007 at ACU (NSW), and that increasing numbers of male students were entering BN studies as their first career choice. These students' main reasons for choosing a nursing career were employment opportunities, altruism and job security, regardless of factors such as their gender, linguistic background and age. While work opportunities and job security are important considerations in any occupation, nursing represents a career opportunity with a professional status and flexible working hours in addition to a source of stable income. Some mature-aged men were particularly attracted to nursing because of the prospects of travel or working abroad and working in a not-for-profit organisation, which supports the findings of other researchers (Wilson 2005; Marsland et al. 1996). The popularity of the nursing profession continues to increase in society (Articlesbase 2010; HCPro 2009; NSW Nurses Association 2007). This trend should be encouraged and needs to continue in order to ease the nurse shortage crisis.

Compared to the mature students in this study, a greater proportion of school-leavers were attracted to a nursing career for altruistic reasons (25.6% school-leavers, 19.9% mature-aged students), which supports the finding of Bosco et al. 2001. Hence, the first attraction of nursing for those school-leavers interested in a

nursing career appears to be a genuine desire to care for humanity, whereas a change to a professional career that offers a secure source of income becomes an important consideration for many other students later in life as they are exposed to the harsh realities of having to earn a steady income.

6.2.4 Problems and challenges faced by nursing students

Many nursing students initially experienced difficulties in their studies as they attempted to adjust to an academic routine. Gradually, they learnt to adapt to university life and to the BN course by embracing diversity, as evident from their study behaviours in class (forming learning communities and participation in group discussions in problem-based learning (PBL) and in practical laboratory classes). As soon as students begin to realise the unity in diversity, much of their difficulties such as feelings of loneliness, hardship and boredom, and difficulties with communication and learning start resolving (Tinto 2008; Farquharson 2007; Zimitat 2003; Cross 1998). While on the campus, interaction amongst students and academics influences the students to develop positive leaning strategies and study behaviours. In a preliminary study (Mehta et al. 2008) of first year BN students at ACU (NSW), a strong correlation was noted between nursing students' use of effective learning strategies to understand the academic material, their perception of satisfaction with the course and successful outcome in the first science unit. Students who understood the academic material were happy with the science units, believed they had adjusted well to university life and expectations, and found it easy to keep up with the course. Such positive developments are crucial not only for retaining students in nursing courses, but also enhance their experiences of nursing education. Most students who participated in the present study were proactive and happy, satisfied that they managed to adapt to university study in general, and to the study of science in particular, by developing and/or adopting effective learning strategies. Student satisfaction is also related to course first preference of students at university and is closely linked to retention (Lawrence 2002).

Many international students from CALD backgrounds struggle learning in English. Fluency in language is pivotal to social interaction, creating learning communities, and student engagement in learning activities (particularly in practical, tutorial and

problem-based classes). Therefore, more support should be provided for students with language issues. Pryjmachuk et al. (2009) concluded that attrition rates in preregistration nursing programs may be minimised if higher education institutions actively target recruitment at mature (and young) candidates, increase the level of qualification required for admission, examine course structures for flexibility and provide student support. However, some students may be aware of the availability of support services on campus but may be so hard-pressed for time that they would be unable to avail themselves of such opportunities.

Investigation of causes of attrition is essential as a better understanding may lead to the development of effective strategies to both recruit suitable students and retain them in nursing courses. According to reports in the literature (Pryjmachuk et al. 2009; Pearce 2004; Elliott 2002, Glossop 2002), students drop out from nursing education because of common reasons such as personal problems (including competing family responsibilities and personal or family illness), feelings of not being valued, unmet expectations, financial burden, emotional distress, wrong career choice, academic difficulties, and communications and operational issues between the university and clinical areas. Attrition of nursing students may be minimised by academic choices to select content that allows more theory-practice links to be made and avoid content overload (Marrewijk et al. 2006). Andrew et al. (2008) advise that attempts to retain students in the first semester may be futile as these students may be unsuited or uncommitted whereas there is greater scope to try to retain those planning to leave in the second semester.

6.2.5 Nursing students' academic expectations, perceptions and experiences of learning science

This study showed a significant increase (83.3% to 100.0%) in the proportions of students commencing BN studies (during 2005-2007) with positive perceptions of the value of science. Furthermore, students desiring more science in the BN course significantly increased from 7.1% of first year respondents to 17.6% of third year respondents. This is a reflection of the changing world as modern nursing is being regarded, and widely accepted, as an art and a science. The split between the arts and the sciences seriously complicates the notion of nursing (Holden 1991). The caring role in nursing constrains nursing into the domain of

the arts, while nursing that embraces high technology pushes in to the domain of science. According to Jennings (1986) it is not a matter of choosing either art or science, but rather skillfully blending both for the betterment of nursing and welfare of public health.

Despite the common student perception that the study of science was challenging, many students (44.4% of first year, 49.8% of second year, and 62.7% of third year) managed to adopt an active learning approach as shown by their development of effective learning strategies and confident participation in class discussions and other learning activities. Students with such positive study behaviours realised that their learning was enhanced and academic performance improved by strategies such as team effort at study, i.e. by forming small groups or "learning communities" to study, revise and practise assessment tasks together (Robinson et al. 2009). Those students who used more of these strategies for active learning, who valued science, and were convinced of the relevance of science to nursing practice felt more in control and confident in their study and were most likely to succeed academically (Mansouri et al. 2006; Thalluri et al. 2005).

Most students at ACU (NSW) felt that the science component was one of the areas of undergraduate nursing education most relevant to clinical practice. In contrast to findings of Andrew et al. (2008), Harvey and McMurray (1997), and Caon and Treagust (1993), this study showed that, in each of the three years of the BN course, more than 95% of respondents stated that they realised the value of science and its significant role in nursing practice, and more than 81% found that the science units integrated well with nursing and clinical units. However, as previous science education was not a prerequisite for admission into the BN course, between 38% and 43% of first year respondents commenced studies with poor or no science background, a factor that contributed to perception that science was difficult. Some students stated that they had not studied science for a considerable length of time (5 to 30 years). However, only 195 (out of 514 first year student informants) reported that they encountered difficulties in learning science. It is possible that more than 195 students may have encountered problems in the first year science units but simply chose to remain quiet. Those

nursing students, having little science education in their backgrounds, initially felt overwhelmed by the science component in first year. An overwhelming majority of students perceived that it was challenging to learn science, yet many students were succeeding in developing effective study strategies and were passing. The longitudinal study showed that there were significant increases between Year 1 students and Year 3 students stating that there was not enough science (for instance, from 1.4% to 19.3%) in the program. These students also suggested that the science content in the nursing curriculum should be increased. This is significant information because science has long been considered difficult, yet many students in this study did not consider the case as they managed to adapt and apply themselves actively to the learning of science. The findings of this study concur with those of other researchers that the science component in undergraduate nursing education is a source of difficulty and anxiety (Friedel & Treagust 2005; McKee 2002), but this is more applicable to first year than to second or third year students. This study disproves the concept that students dislike science. How science is taught to nursing students is very likely to be an important factor as it potentially influences students to develop interest in, and cope in the science units.

Some students experienced difficulties in learning science or found science "boring". As students continued to learn science throughout the BN course, their stated perceptions changed: there was a significant increase in the Year 3 students' perception that learning science as "manageable" and a decreasing trend in the perception that science was "boring" compared to their perceptions in Year 1. The combined data of the three cohorts each of first, second and third year of BN course shows that a significant majority (approximately >95%) of students appreciated the relevance of nursing science throughout the BN course. A majority of students, regardless of gender, age, and linguistic background perceived that the science and clinical units integrated well, and stated that they learnt a lot in the science units. Students' perception that the science and clinical units integrated "extremely well" increased significantly on progressing to Year 3 from Year 1. Less than 18.7% indicated that the science and nursing units did not integrate well. However, there were significant decreases in the percentages of

Year 2 and Year 3 students having negative perceptions of integration of science and clinical units, compared to Year 1 students.

Some students were not confident about learning science, probably related to having irregular attendance patterns (being absent in lectures and other classes), non-participation in class discussions and activities, and rote learning (attempting to memorise large volume of notes). These students were simply intent on fulfilling course requirements, making remarks such as *"all I want is a Pass in the science units"*. Nurse graduates who barely manage to pass in the assessments are more likely to compromise the quality of care compared to the competent, skilled nurses (Andersson & Edberg 2010). Poor learning behaviour and study habits were identified as a passive or surface approach to learning, which has been reported to result in mostly superficial level of understanding (Mansouri et al. 2006; Thalluri et al. 2005). Those students repeating a science unit after failing (Chapter 5) possessed many similar demographic factors and character traits to successful students, but most admitted that the cause of failure was lack of application. How would it be possible to better motivate and engage these students?

6.3 Recommendations for policy and practice

6.3.1 Recommendations for attracting students into the nursing profession

In order to manage the ongoing shortage of nurses, there is an urgent need to attract more students with science backgrounds to nursing. Some Australian universities are offering nursing to graduate students. It is possible that graduates who enter pre-registration nursing education may be better orientated to nursing studies and/or are more likely to remain in the nursing profession.

It is imperative that nursing faculties continue to recruit and retain a diverse cohort of students, so that nursing becomes more typical of the population it serves. The need for male nurses cannot be denied. Patients tend to prefer a nurse of their own gender when the clinical situation is "intimate", and are more accepting of either gender when the situation is not physically invasive (Chur-Hansen, 2002) or when there is a shortage of nursing staff. A gender-balanced nursing model, both for the student and patient, is desirable in promoting social justice and meeting the high level of healthcare service expected by today's society. Increased enrolment

of men into nursing programs should be encouraged to continue. In addition, the retention of males in nursing education and in the workforce is equally important.

There is an urgent need for collaboration of educational institutions and healthcare organisations world-wide to promote nursing as an appealing career choice with prospects for ongoing advancement for young men and women, through implementation of various initiatives and marketing strategies. Nursing offers job security and satisfaction, yet it is of concern that relatively few young Australian school-leavers are choosing the profession. The number of Australian male school-leavers commencing the BN course is much less than the already low number of Australian female school-leavers. In order to address the shortage of practicing nurses in Australia and to reduce dependence on overseas-qualified nurses, a need is recognised for promoting the profession to all young Australians. A more realistic and balanced (not romantic) portrayal of nursing could be a positive influence for the profession.

Awareness of the image of nursing as a skilled profession needs to be increased among high-school students by implementation of effective advertising campaigns at school career days and at career forums. Factors that could assist the nursing profession to attract and retain future nursing students include: concerted efforts to promote choice of biology, chemistry and physics as high-school electives; providing more and current information on nursing career to secondary schools; and presenting talks to high-school students by role models who reflect the diversity and complexity of the nurses' world. Thus, with the assistance of school career advisors and qualified nurses as role models, nursing may be promoted positively as an occupation that offers: excellent employment opportunities and job security; good prospects of salary progression; leadership roles such as shift co-ordinators or clinical nurse educators; and a range of specialty areas with freedom to move around between specialty caring roles (such as palliative care nurse) to more science and technology based roles (such as intensive care unit or coronary care unit nurse) (Brown 2009; Muldoon & Reilly 2003; Bosco et al. 2001; Boughn 2001; Hemsley-Brown & Foskett 1999).

In some societies, nursing has been seen as a gendered female profession (Holroyd et al. 2001). Sex-role stereotypes such as seeing nursing as "women's occupation" (Simpson 2005), deter men from entering nursing (Harding 2008; Kermode 2006). In order to recruit more men into nursing education and retain them in the profession, academics should strive to reduce gender stereotypes in the teaching. This could be achieved by adopting a teaching approach that avoids gender bias; for example, selecting case studies, test items or textbooks that are gender-neutral in their content. Since male students prefer scenario-based, practical and interactive learning approaches, such opportunities could be promoted to facilitate student engagement. Furthermore, male students usually enjoy, and are comfortable with, the technical aspects of nursing - providing such a learning environment should help retention rates. The lack of gender connectivity causes male students to feel isolated and vulnerable and their early clinical experiences are usually stressful (Newton & McKenna 2009; Farquharson 2007; Stott 2007). Teaching staff need to consider providing opportunities for undergraduate male nursing students to discuss any problems. Implementation of initiatives such as more male role-models (male academic advisors and other practicing male nurses), academic-led mentoring and peer-support sessions would be beneficial for male students.

While catering to the needs of male students, university academics should be cautious that they do not disadvantage female students. Academics need to be sensitive to gender preferences regarding learning styles in order to create a learning environment of equal opportunity, competency and achievement for both genders (James 2010; Wehrwein et al. 2007). Awareness of the students' learning style preferences informs the development of most effective teaching approaches; this helps to overcome the tendency of some academics to treat all students in the same way. It also motivates academics to move from their preferred mode(s) to using multiple modes of teaching. Essentially, academics' teaching approaches should engage students with different learning styles. Students may be influenced to remain interested in science by a teaching style that incorporates multiple pedagogical approaches rather than a singular approach. Issues that need further investigation include: Does students' learning style preference correlate with their academic performance? What are the effects of gender in learning preferences

and academic performance? More balanced representation of both genders in nursing will lead to a strong healthcare force that is well equipped to understand and contribute to the changing healthcare needs of society.

6.3.2 Recommendations for teaching diverse tertiary cohorts

Internationalisation poses challenges and responsibilities for the academic staff. Student diversity can be problematic to university academics as they are required to meet the educational and personal needs of students with various educational ability and diverse learning styles to make their tertiary experience accessible, relevant and as high quality as possible. Academics should ensure that students have access to adequate level of resources and support services while on and off university campus, and encourage students to utilise such services. For instance, provision of training in educational technology for international students from developing countries and mature-aged students (especially Baby boomers and Generation Xers) would be beneficial, especially for students studying complex subjects such as science (Sieber 2009; Kennedy et al. 2008; Gabbert & Sims 2007; Ma & Saunders 2006). Academics can provide an interactive, interesting, and productive learning environment for students through the use of a generationally appropriate communication and teaching styles, and accommodating generational differences in attitudes, values and behaviours.

Rapid, unplanned changes in nursing education, such as large numbers of students from diverse cultural, linguistic, educational, occupational, and socio-economic backgrounds studying together affect students' learning by presenting challenges to the students as well as to the university staff. The challenge for the students is to cope with content that is designed to keep up with advances in science and technology, whereas the challenge for nursing educators is to design course content to satisfy the professional requirements yet meet students' changing needs. Hence, this investigation aimed to better understand nursing students' changing learning needs, perceptions and experiences.

Learning and teaching in higher education nowadays is essentially a complex and dynamic process (Carrick Institute 2008), one which is sure to baffle an unsuspecting or unprepared student. Students are under constant pressure to

keep up with studies and many, particularly those who are unprepared, immature, lazy, depressed or isolated often fall behind in studies. Tinto (2008) points out "students who learn together become more academically and socially engaged and learn more". A way forward to achievement of quality learning, teaching and student support (thereby enhancing the experience of transition to higher education) is through institutional commitment of investing in resources, provision of adequate services, and implementing strategies such as connecting with students and the issues they face (Krause 2003). Students who feel "connected" to their university campus and faculty achieve greater academic success (McInnis 2003). Therefore, it is imperative that academics attempt to foster cohort cohesion by guiding "peer support" initiatives for struggling students (Robinson et al. 2010; Tinto 2008; Farquharson 2007; Wilson et al. 2006). Creating compatible friendships provides students with necessary emotional support and provides a buffer to stressful situations (Wilcox et al. 2005). The students who seem to benefit most from student engagement efforts tend to be those who are performing least well (Robinson et al. 2010; Carini et al. 2006).

Although academics are endeavouring to be culturally sensitive and cater to student diversity, ironically some students (in this study) stated that they found it hard to adjust to the multiplicity of teachers and teaching styles. Recruiting and training the healthcare students from different ethnic groups, including exposing them to various teaching styles and teachers from CALD backgrounds, is a strategy that will promote retention of students who will provide culturally relevant care, or "transcultural nursing" (Haden et al. 2003; Yoder 2001). It is through cultural encounters that the experience of learning is enriched, as students' learning progresses from a state of awareness to proficiency (Pacquiao 2007; Shakya & Horsfall 2000). As cultural competence leads to positive outcomes in healthcare, there is a need for cultural competence education (teaching attitudes, knowledge and skills that empower nurses to care effectively for diverse groups) and academics from diverse ethnic backgrounds (Pacquiao 2007; SREB 2002). Furthermore, Pacquiao (2007) points out that contact with diverse groups allows for dismantling of stereotypes, practice in intercultural communication, and development of skills in cross-cultural relationships. Cultural awareness enables

nursing graduates to better serve diverse populations and thereby uphold excellence in healthcare (Omeri 2006).

Universities need to respond appropriately to provide a supportive learning environment. Retaining students in the BN program is a significant factor in planning to meet students' needs because the high attrition rate from undergraduate nursing education has widespread implications for the nursing workforce, which is experiencing major shortages. However, the academic world continues to change rapidly, and the "seesaw" of expectations and outcomes may frequently become imbalanced and difficult to control both, for the student and the academic. Many nursing schools have not kept their curriculum on pace with advances in science and technology (Benner et al. 2010; Glasgow et al. 2010). The task of designing courses to cater for the diverse body of students is made more complex by the flexibility of the study modes and students' level of participation, as students have differing preferences for days and times for study and paid work. Furthermore, many students spend less time on campus than in the past as they juggle work, study and their social life.

Awareness of students' linguistic issues is important for lecturers who, by being more sensitive to the concerns and needs of students, could implement appropriate changes to assist students in minimising stress and maximising outcomes. Those CALD students who lack academic skills and/or are not competent in English language and medical terminology need extra academic, emotional and social support through initiatives such as mentoring, participating in a student learning community, or peer support. These students would benefit in nursing studies if their fluency in English language improved. This is consistent with the findings and opinions of other authors (Salamonson et al. 2009; Salamonson & Andrews 2006; Shakya & Horsfall 2000). While student support services exist on campus, some students are so hard pressed for time that they do not avail themselves of such opportunities. Therefore, struggling students should be identified early and encouraged to access university support services on campus, including peer support programs.

6.3.3 Recommendations for teaching science

If nursing is to improve its status, nurses need to be credible members of the multidisciplinary team, and the scientific knowledge of new graduate nurses needs to improve to achieve this (Friedel & Treagust 2005). Many researchers have identified a gap between nursing students' knowledge of scientific theory and clinical practice (Robinson et al. 2010; Astin et al. 2005; Friedel & Treagust 2005), and have emphasised the value of a strong foundation of science early in the BN program. If the science component of nursing education is significantly reduced, then students feel unprepared for their roles on registration (Davis 2010). Despite Australia being geographically isolated from other Western countries, most of the findings about nursing education in Australia (Salamonson et al. 2010; Drury et al. 2009; Andrew et al. 2008; Thalluri et al. 2005) concur with the experiences reported in countries such as UK (Cameron et al. 2010; Davis 2010), USA (Ierardi et al. 2010), Canada (Dyck et al. 2009), and Ireland (McKee 2002). Diversity of students, curriculum development, redesigning of healthcare systems, and information and technology advances are just a few of the growing challenges that are facing those who choose to teach (Billings & Halstead 2004).

Recommendations arising from the present study include the importance of promoting academic awareness of student diversity and student preferences for learning modalities in science units, and of meeting their varied learning needs. Nursing students are encouraged in their learning when they see that their individual needs are being met. Therefore, in order to retain students in the BN course, there should be a focus on motivating and catering to the diverse learning needs of the heterogeneous student sub-populations. This is particularly important in the science units, which some students fear and many find challenging (see Chapter 5). This fear of understanding and remembering the science content may be related to a range of demographic factors, previous science study, and work experiences. If this fear of learning science is addressed, it may increase further student numbers, or at least reduce attrition. In cases where fear of science has increased by studying at tertiary level, such students are more likely to withdraw from the course. However, in most cases, fear of science decreased by actually studying science. Academic led peer support initiatives at ACU (NSW), having the potential to deliver equitable outcomes for marginalised students, were

instrumental in promoting student interaction, increasing student retention, and reducing failure rates in the science units (Robinson et al. 2010).

In order for students to be more committed to study in the science units, they need to be convinced of the importance and relevance of science to nursing practice. Lecturers need to make science vital and relevant. This involves engaging students by making science more relevant to nursing practice such that students are able to identify the links between theory and practice. In addition, cohort cohesion and active engagement in the study of science units can be fostered through the utilisation of an integrated pedagogical approach, in which lead lectures, tutorials, practical classes, and problem-based learning form the main teaching modes. The course material can be effectively delivered through multiple teaching strategies that empower students to learn the fundamental principles of nursing intervention as well as acquire skills to become lifelong learners. This helps to increase their confidence in developing effective study strategies to learn science. Students who leave or are thinking of leaving because of difficulties in learning science need to be interviewed to inform development of best practice retention strategies.

In the present study, different learning methods were favoured by different student groups. Students' preference for learning science was found to be multimodal and multifactorial in that students were sensitive to what was taught, the amount of content and how it was taught. More nursing students were possibly multimodal learners than unimodal learners, although some students generally indicated low preferences for practical laboratory classes and self-directed learning in the science units. However, many students were adamant that the multimodal approach (collective use of lecture, practical, problem-based learning and tutorial modes) in the delivery of science was effective, requiring no reduction in content or omission of any particular instruction mode, thus validating the efficacy of the teaching methods in use. It does not seem immediately necessary to make any significant changes in the way science is taught to the current and future generation of nursing students at ACU (NSW). James et al. (2011) at ACU (Melbourne Campus) reported that the predominant preference of first year nursing and midwifery students for learning science was quadmodal utilising

visual, aural, read-write and kinaesthetic (VARK) learning styles. Learning preferences of unimodal learners may change with time. Therefore, in many situations where a large number of students are present and/or the audience is very diverse, it is more appropriate to cater to the needs of the multimodal learners in the delivery of scientific knowledge than to the needs of unimodal learners, so as to maximise the learning experiences for the majority. Tanner and Allen (2004) stress the importance of academics adopting a teaching style that engage students with various learning styles. Science coursework, regardless of the pedagogical style of the instructor, is generally rich in the amount of information being presented. In order to reach diverse audiences of learners, science teachers need to differentiate and diversify their own teaching styles and pedagogical approaches. It is neither possible nor desirable to tailor course work to the individual learning styles of each student. In a study carried out by Davies et al. (2000) in the UK, it was reported that the majority of nursing students found the three teaching strategies: lectures, tutorials and laboratory sessions, of approximately equal value to their learning of science and practice. Their results supported the continuation of lead lectures and laboratory work in science, in conjunction with a specifically designed tutorial system. It is recommended that the teaching of science to nursing students remain balanced and inclusive of the major teaching modes that facilitate varying levels of student participation and interaction.

6.4 Limitations of the study

The study was wide ranging and exploratory in nature. Although the longitudinal design was ideal to extract serial data, it was only possible to adopt a "snapshot" approach that captured the views of some students. One drawback of such a snapshot analytical approach is that it is retrospective and out-dated before it is possible to respond to the findings (Neuman 2011). Nonetheless, this approach during the tumultuous change provided a valuable historic perspective of what it was like to be a nursing student in the period 2005-2009.

Accessing all students to participate in this research was not possible because of the low attendance of some students at lectures and other campus activities. A larger responding sample would have enriched the research by enhancing its

generalisability. The completion of the survey was voluntary, and many students exercised their right not to participate. The study possibly only captured the views and experiences of articulate, keen students attending the campus, and missed non-attending lazier students with lower aspirations, as well as those students who missed classes due to work, health or family issues. Critical review of the study, however, suggested that despite the lower than desired numbers of participants, those students who engaged in the research methodologies did represent the diverse student cohorts in terms of gender and age (as confirmed statistically). However, significantly more English-speaking students, than students from CALD backgrounds, participated in the surveys. It was a pity not to have been able to capture information from this vulnerable group of students who probably represent those most in need of supportive intervention.

As the surveys pertained to students' learning experiences in the science units, some struggling students may have been overwhelmed and so averse to science that they opted not to respond. Attempts were made to improve the response rate by increasing students' awareness of the importance of the research project; students were also encouraged to regularly attend learning sessions on campus. Offering the questionnaire for completion online was considered and attempted with first year male students, but only three (out of a potential 98) responses were received, so this process was not extended.

Considering the limitations of fixed response surveys, student responses in the form of focus group discussions and one-to-one interviews added another layer of relevant and significant information. However, open discussions also have limitations as students might tailor their responses to what they think is expected of them. Some students may have found it difficult to open up and describe problems honestly as the investigator was an academic in a position of perceived power. There is also the gender issue of student and researcher: the moderator in the focus group discussion sessions, and the interviewer in the one-to-one interviews, was a man. Questions from a female moderator or interviewer might have elicited different responses. Furthermore, participation in focus group discussions was low. No students returned in successive years to participate

further in focus groups or interviews so it was not possible to follow up individual students.

In this study, it was not possible to include those students who withdrew from the BN course; only surviving students were accessed in the second semester of first year. Significant information may be obtained by accessing those students who are struggling or are contemplating discontinuation from the course. Such students might have been able to provide valuable information that could lead to reduction in attrition rate and enhancement of learning experience for the remaining students.

6.5 Recommendations for future research

It would be interesting to try to overcome some of the limitations of this research by gaining a deeper insight into those students who do not come to class or who drop out in the first semester of their studies. Attrition of students from nursing courses needs to be managed in order to reduce the adverse effects of the current nursing shortage. This requires extensive research into reasons for student attrition from nursing courses and measures that will retain them in the profession.

As male students comprised a minority in the nursing student population, and only small numbers of men participated in this study, questions that require academic attention include: "Do male nursing students get treated fairly?", "Are they getting equal opportunities?", "Are their learning and social needs being met?", and "What are the effects of demographic characteristics such as age and ethnicity on male students' learning styles?". Further extensive study is necessary to address these issues. The reasons behind the numerical disparity between male and female nurse practitioners need to be evaluated.

Active learning is fostered when instructional methods engage students in the learning process (Bonwell & Eison 1991, cited in Glass & Sue 2008). Active learning can significantly improve recall of information, and substantially contributes to student engagement (Prince 2004). Based on their findings, Cuthrell and Lyon (2007) maintain that students prefer learning strategies consisting of

both, active and passive modes of instruction. Future research may be directed at measures to increase student attendance at lectures and classes or otherwise to improve outcomes for non-attending students. In addition, students' academic performance in science units may be measured and correlated with factors such as their level of commitment to paid employment, learning behaviours and study habits/preferences. A detailed qualitative investigation may be conducted by organising follow-up sessions with focus groups and individual students. The magnitude of links between the constructs that make up the concept map may be investigated using sophisticated multivariate techniques such as structural equation modelling (SEM). Further in-depth study of how heterogeneous bodies of students learn science, including their learning styles is warranted as this would inform best practice for teaching and learning in the science units in the BN curriculum. Detailed investigation into learning and teaching may be conducted for students enrolled in science-based, inter-professional units (IPL) in courses such as nursing, paramedicine, midwifery, psychology, physiotherapy, and exercise/sports science at the Australian Catholic University and other Australian universities.

6.6 Conclusions

Expansion of the BN degree program at ACU (NSW) during the 2005 to 2007 period presented a unique environment in which large numbers of diverse students gathered. Such student diversity means that it is no longer possible to generalise the characteristics of a typical student at an Australian university. A commencing nursing student could be any or a combination of the following:

- An Australian citizen straight from High School with career ambitions, who may or may not be academically and/or financially stable and who may not have the social skills to interact as an equal with older more dominant students.
- A high-achieving student who missed out on a position at a medical school and is hoping to use nursing as a springboard to a career in medicine.
- A young person intent on travelling the world who feels stuck with an uncertain future in nursing, and is thinking about leaving the course.

- An iPod-clutching, non-library visiting person engaged in part-time to full-time paid employment to pay the rent for shared accommodation.
- An initially homesick international student highly orientated to study, perhaps keen to secure employment and/or Australian residency.
- An international CALD student with no previous science education struggling to cope with the nursing program, especially the science.
- A student from a CALD or remote/rural background, perhaps lacking competency in English language and/or academic skills and access to technology.
- A mature-aged student with family, work and other commitments having very little time at home for study.
- A mature-aged student returning to studies after many years and struggling to adjust to student life and the advances in technology that impact on the learning environment.
- A mature-aged Australian student with work experience in diverse disciplines choosing a career change to healthcare.
- A lazy, unmotivated student, perceiving course content to be huge, and taking longer to complete the course.
- An enrolled nurse wishing to qualify as a Registered Nurse.
- An intelligent and industrious student who is enthusiastic about study, well organised, manages time well and is a high achiever.

As a consequence of globalisation, internationalisation and technological advances at this critical time of increased demand for skilled graduates, the characteristics of a typical student at an Australian university are hard to define. However, the student population was largely homogeneous with respect to learning behaviour and perceptions of learning science as all students identified with and worked towards a common goal. This study has shown that students demonstrating variations in age, ethnicity, social skills, academic ability and commitment to study eventually adapt and learn to cope with the complexities of learning science. While progressing through the undergraduate years, student perceptions of science change as they begin to integrate scientific knowledge with nursing practice. Such theory-practice links enable students to become

increasingly convinced of the importance and relevance of science in nursing. This conviction motivates them to engage actively in the study of science, such that they desire more science in the nursing course.

This study provides an insight into students' perceptions and experiences of tertiary education and learning behaviours at the time of rapid, unplanned change in academic environment, and disproves the stereotype that nursing students dislike science. Lecturers need to avoid content overload and make science relevant to nursing practice. The findings of this study may be generalised to other Australian universities and the current tertiary climate, and provide the basis for further research and reflection on practices which can support learning and teaching. This will lead to enhancement of students' overall experience of nursing education, and thereby facilitate maximal retention of students in Bachelor of Nursing programs in Australian and worldwide universities.

Awareness of the potential impact of student diversity on the academic environment, and a better understanding of undergraduate nursing students' perceptions, expectations and varied needs will enable academics to adapt courses to suit students' expectations and needs. This would lead to the development and delivery of programs that facilitate and enhance students' learning, promote retention and result in the transition of highly competent nurses into the ever-changing, dynamic workforce in the 21st Century. Such increased awareness of students' diverse needs, together with keeping up with developments in the nursing profession, is paramount to keeping the undergraduate nursing education dynamic, effective and accessible to all in a changing world.

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Appendices

Appendix A

Approval Letters for Study from Australian Catholic University Human Research Ethics Committee

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

ACU National

Human Research Ethics Committee

Committee Approval Form

Principal Investigator/Supervisor: Dr Kathy Robinson Nth Sydney Campus

Co-Investigators: Dr Sharon Hillege Nth Sydney Campus

Student Researcher: Mr Hemant Mehta Nth Sydney Campus

Ethics approval has been granted for the following project:
Evaluations of students' academic expectations and perceptions of science in the Bachelor of Nursing program

for the period: 31 October 2005 to 30 September 2006

Human Research Ethics Committee (HREC) Register Number: N200506 14

The following standard conditions as stipulated in the *National Statement on Ethical Conduct in Research Involving Humans* (1999) apply:

(i) that Principal Investigators / Supervisors provide, on the form supplied by the Human Research Ethics Committee, annual reports on matters such as:
- security of records
- compliance with approved consent procedures and documentation
- compliance with special conditions, and

(ii) that researchers report to the HREC immediately any matter that might affect the ethical acceptability of the protocol, such as:
- proposed changes to the protocol
- unforeseen circumstances or events
- adverse effects on participants

The HREC will conduct an audit each year of all projects deemed to be of more than minimum risk. There will also be random audits of a sample of projects considered to be of minimum risk on all campuses each year.

Within one month of the conclusion of the project, researchers are required to complete a *Final Report Form* and submit it to the local Research Services Officer.

If the project continues for more than one year, researchers are required to complete an *Annual Progress Report Form* and submit it to the local Research Services Officer within one month of the anniversary date of the ethics approval.

K. Pashley.

Signed: ..... Date: 28 October 2005
(Research Services Officer, McAuley Campus)

QLD Ethics/mcauley@MCAULEY Sent by: Kylie Pashley@MCAULEY 01/02/2007 02:54 PM	To	kathy robinson/mackillop@mackillop, hemant mehta/mackillop@mackillop
	cc	
	bcc	
	Subject	N2005.06-14 Ethics Extension and Modification

Dear Kathy and Hemant,

Thank you for returning the Ethics Progress Report and Modification request for your project N2005.06-14 *Evaluations of students' academic expectations and perceptions of science in the Bachelor of Nursing program.*

The Deputy Chair of the Human Research Ethics Committee has approved your request to extend the period of data collection. The new expiry date for data collection is the **30 April 2009**.

The Chair of the Human Research Ethics Committee has approved the modification request to include focus groups.

We wish you well in this ongoing project.

Kind Regards,

Kylie

Kylie Pashley
Research Services
McAuley at Banyo Campus
PO Box 456
VIRGINIA QLD 4014
AUSTRALIA

Tel (+61 07) 3623 7429 Fax (+61 07) 3623 7328
EMAIL: k.pashley@mcauley.acu.edu.au

Australian Catholic University Ltd
ABN 15 050 192 660
CRICOS Registration codes:00004G, 00112C, 00873F, 00885B

Appendix B

Questionnaire Developed for Pilot Study

Pilot questionnaire – BN Year 1

For questions 1-5, please tick the appropriate box:

1 I am: [ ] male [ ] female
2 I am: [ ] under 20 [ ] 20-30 [ ] over 30
3 Have you previously done any tertiary studies? [ ] Yes [ ] No
4 I am living: [ ] alone [ ] with family [ ] with other students
5 I have access to a computer where I live: [ ] Yes [ ] No

For questions 6-15, please circle the appropriate response:
[SA = Strongly agree; A = Agree; N = Neutral; D = Disagree; SD = Strongly disagree]

6 I am glad that I chose to study the nursing course SA A N D SD
7 I believe that I have adjusted well to university life and expectations SA A N D SD
8 I mostly understand the lecturers/tutors SA A N D SD
9 I have developed study techniques SA A N D SD
10 I expected that the first year nursing science unit would be easily manageable SA A N D SD
11 I am finding it easy to keep up with other students SA A N D SD
12 I do preliminary reading before a lecture, tutorial or practical class SA A N D SD
13 I make additional notes to help me in my study SA A N D SD
14 I often hesitate to ask questions during a learning session SA A N D SD
15 I find it necessary to carry:
[ ] an English dictionary [ ] a medical dictionary
[ ] not necessary to carry any dictionaries
16 What is your first/home language? _____
17 What is the hardest part about your transition to university learning?

_____
_____
_____
_____

18 Please use the following space to write any comments about your transition to university learning:

_____
_____
_____
_____
_____

19 I have voluntarily completed this questionnaire: [ ] Yes [ ] No

Your participation is greatly appreciated – Thank you!

April 2005

Appendix C

Questionnaires used in Main Study

Appendix C1

First Year Questionnaire

First Year Questionnaire

1. I am: [ ] female [ ] male
2. Age: [ ] under 20 [ ] 20 – 30 [ ] over 30
3. I am living: [ ] alone [ ] with friends [ ] with a partner [ ] with parent(s)
4. I have: [ ] no children [ ] 1 child [ ] 2 or more children
5. Country of birth: _____ Country of residence: _____
6. First language _____

   Other languages spoken at home: _____
7. How many hours of home/off-campus study time and paid work do you undertake per week?

   Hours of home/off-campus study time per week: [ ] 0 [ ] 1 – 7 [ ] 8 – 14 [ ] 15 – 21 [ ] 22 – 35
   Hours of paid work per week: [ ] 0 [ ] 1 – 7 [ ] 8 – 14 [ ] 15 – 21 [ ] 22 – 35

8. Was Nursing your first career choice? [ ] Yes [ ] No (first career choice was_____)
   Previous occupation (if any) _____

9. What was your main reason for choosing a career in nursing? Please tick as many responses as relevant:
   [ ] Nursing is a secure job
   [ ] There are many employment opportunities in nursing
   [ ] I have a strong interest in disease and clinical science
   [ ] My passion is caring for people and helping them to lead healthy lives
   [ ] Nursing is a specialised profession requiring expert knowledge and skills
   [ ] Nursing is a good job for a parent because of flexible hours for child care
   [ ] Other reason(s) Please state _____

_____

10. In what year (date) and at what level (Yr 10, Yr 12, tertiary) did you last study science?

_____

11. Should High School Biology be a requirement for entry into the BN course? [ ] Yes [ ] No
12. How important is it to understand the science behind nursing principles?
    [ ] Very important [ ] Important [ ] Not very important [ ] Not important at all
13. Comment on the amount of science in the first year of the BN course. I think there is:
    [ ] Enough science [ ] Not enough science [ ] Too much science
14. Which method of delivery of the science courses have you found most effective?
    [ ] Lecture [ ] Tutorial [ ] Practical class
15. Which aspect of delivery of the science courses have you found most enjoyable?
    [ ] Lecture [ ] Tutorial [ ] Practical class
16. Which component of first year science do you find most interesting?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics
17. Which component of science do you find most relevant:
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics
18. Which component of science do you find most difficult?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics
19. How often do you read a science textbook?
    [ ] Daily [ ] Weekly [ ] Monthly [ ] Occasionally [ ] Never
20. Do you borrow science books from the university library? [ ] No [ ] Rarely [ ] Sometimes [ ] Regularly

21. I have read the following science texts: _____

22. Before you started the BN course, which of the following statements best described your perception of science? *(Please tick as many as relevant)*
    [ ] Important for medical advances [ ] Interesting and relevant
    [ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

23. Being in the first year of the course, which of the following statements best describe your perception of science? *(You may tick more than one)*
    [ ] Important for medical advances [ ] Interesting and relevant
    [ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

24. What grade do you **realistically** hope to obtain in the science units?
[ ] Pass [ ] Credit [ ] Distinction [ ] High Distinction

25. How much do you value the science units in the nursing program?
[ ] Highly value [ ] Value [ ] Do not value much [ ] Do not value at all

26. How well have the science units integrated with the nursing and clinical units you have studied?
[ ] Extremely well [ ] Quite well [ ] Not very well

27. Do you have or have you had any problems with your nursing science studies? [ ] Yes [ ] No
If yes, please specify the nature of problem/s _____

_____

28. Do you think you will continue and complete the BN course? [ ] No [ ] Yes

For questions 29 to 38, please tick as appropriate:

	Strongly agree	Agree	Disagree	Strongly disagree
29. I feel that the nursing science units this year have kept me motivated				
30. I have learnt a lot in the science units				
31. I have begun to appreciate the relevance of science to nursing				
32. Nursing science studies have helped me understand English medical terminology				
33. I find it easy to use electronic technology for learning (computer, WebCT intranet, and internet)				
34. I am finding it hard to juggle university studies and family commitments				
35. I am finding it hard to balance university studies and work commitments				
36. Teaching staff are supportive and respond to my learning needs				
37. I believe that progress in English language would help me with my studies *Please tick if not applicable* [ ]				
38. I participate in courses/workshops to improve communication skills				

39. Any additional comments

_____

_____

_____

_____

Your participation in this questionnaire is greatly appreciated – Thank you!

Appendix C2

Second Year Questionnaire

Second Year Questionnaire

1. I am: [ ] female [ ] male
2. Age: [ ] under 20 [ ] 20 – 30 [ ] over 30
3. I am living: [ ] alone [ ] with friends [ ] with a partner [ ] with parent(s)
4. I have: [ ] no children [ ] 1 child [ ] 2 or more children
5. Country of birth: _____ Country of residence: _____
6. First language: _____

   Other languages spoken at home _____

7. How many hours of home/off-campus study time and paid work do you undertake per week?

   Hours of home/off-campus study time per week: [ ] 0 [ ] 1 – 7 [ ] 8 – 14 [ ] 15 – 21 [ ] 22 – 35
   Hours of paid work per week: [ ] 0 [ ] 1 – 7 [ ] 8 –14 [ ] 15 – 21 [ ] 22 – 35

8. Was Nursing your first career choice? [ ] Yes [ ] No (first career choice was_____)
   Previous occupation (if any) _____
9. What was your main reason for choosing a career in nursing? Please tick as many responses as relevant:
   [ ] Nursing is a secure job
   [ ] There are many employment opportunities in nursing
   [ ] I have a strong interest in disease and clinical science
   [ ] My passion is caring for people and helping them to lead healthy lives
   [ ] Nursing is a specialised profession requiring expert knowledge and skills
   [ ] Nursing is a good job for a parent because of flexible hours for child care
   [ ] Other reason(s) Please state _____

_____

10. Before BN, in what year (date) and at what level (Yr 10, Yr 12, tertiary) did you last study science?

_____

11. Should High School Biology be a requirement for entry into the BN course? [ ] Yes [ ] No
12. How important is it to understand the science behind nursing principles?
    [ ] very important [ ] important [ ] not very important [ ] not important at all
13. Comment on the amount of science in the second year of the BN course. I think there is:
    [ ] enough science [ ] not enough science [ ] too much science
14. Which method of delivery of the science courses have you found most effective?
    [ ] Lecture [ ] Tutorial [ ] PBL [ ] Practical class
15. Which aspect of delivery of the science courses have you found most enjoyable?
    [ ] Lecture [ ] Tutorial [ ] PBL [ ] Practical class
16. Which component of second year science do you find most interesting?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
17. Which component of science do you find most relevant:
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
18. Which component of science do you find most difficult?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
19. How often do you read a science textbook?
    [ ] daily [ ] weekly [ ] monthly [ ] occasionally [ ] never
20. Do you borrow science books from the university library? [ ] No [ ] rarely [ ] sometimes [ ] regularly
21. I have purchased/borrowed the following science texts:

_____

_____

22. Before you started the BN course, which of the following statements best described your perception of science? *(You may tick more than one)*
    [ ] Important for medical advances [ ] Interesting and relevant
    [ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

23. Being in the second year of the course, which of the following statements best describe your perception of science? *(You may tick more than one)*
[ ] Important for medical advances [ ] Interesting and relevant
[ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

24. What grade do you **realistically** hope to obtain in the science units?
[ ] Pass [ ] Credit [ ] Distinction [ ] High Distinction

25. How much do you value the science units in the nursing program?
[ ] Highly value [ ] Value [ ] Do not value much [ ] Do not value at all

26. How well have the science units integrated with the nursing and clinical units you have studied?
[ ] Extremely well [ ] Quite well [ ] Not very well

27. Do you have or have you had any problems with your nursing science studies? [ ] Yes [ ] No
If yes, please specify the nature of problem/s _____

_____

_____

28. Do you think you will continue and complete the BN course? [ ] No [ ] Yes

For questions 29 to 38, please tick as appropriate:

	Strongly agree	Agree	Disagree	Strongly disagree
29. I feel that the nursing science units this year have kept me motivated				
30. I have learnt a lot in the science units				
31. I appreciate the relevance of science to nursing				
32. Nursing science studies have helped me understand English medical terminology				
33. I find it easy to use electronic technology for learning (computer, WebCT intranet, and internet)				
34. I am finding it hard to juggle university studies and family commitments				
35. I am finding it hard to balance university studies and work commitments				
36.Teaching staff are supportive and respond to my learning needs				
37. I believe that progress in English language would help me with my studies *Please tick if not applicable* [ ]				
38. I participate in courses/workshops to improve communication skills				

39. Any additional comments _____

_____

_____

_____

_____

Your participation in this questionnaire is greatly appreciated – Thank you!

Appendix C3

Third Year Questionnaire

Third Year Questionnaire

1. I am: [ ] female [ ] male
2. Age: [ ] under 20 [ ] 20 – 30 [ ] over 30
3. I am living: [ ] alone [ ] with friends [ ] with a partner [ ] with parent(s)
4. I have: [ ] no children [ ] 1 child [ ] 2 or more children
5. Country of birth: _____ Country of residence: _____
6. First language: _____

   Other languages spoken at home _____

7. How many hours of home/off-campus study time and paid work do you undertake per week?

   Hours of home/off-campus study time per week: [ ] 0 [ ] 1 – 7 [ ] 8 – 14 [ ] 15 – 21 [ ] 22 – 35
   Hours of paid work per week: [ ] 0 [ ] 1 – 7 [ ] 8 –14 [ ] 15 – 21 [ ] 22 – 35

8. Was Nursing your first career choice? [ ] Yes [ ] No (first career choice was_____)
   Previous occupation (if any) _____
9. What was your main reason for choosing a career in nursing? Please tick as many responses as relevant:
   [ ] Nursing is a secure job
   [ ] There are many employment opportunities in nursing
   [ ] I have a strong interest in disease and clinical science
   [ ] My passion is caring for people and helping them to lead healthy lives
   [ ] Nursing is a specialised profession requiring expert knowledge and skills
   [ ] Nursing is a good job for a parent because of flexible hours for child care
   [ ] Other reason(s) Please state _____

_____

10. Before BN, in what year (date) and at what level (Yr 10, Yr 12, tertiary) did you last study science?

_____

11. Should High School Biology be a requirement for entry into the BN course? [ ] Yes [ ] No
12. How important is it to understand the science behind nursing principles?
    [ ] very important [ ] important [ ] not very important [ ] not important at all
13. Comment on the amount of science in the third year of the BN course. I think there is:
    [ ] enough science [ ] not enough science [ ] too much science
14. Which method of delivery of the science courses have you found most effective?
    [ ] Lecture [ ] Tutorial [ ] PBL [ ] Practical class
15. Which aspect of delivery of the science courses have you found most enjoyable?
    [ ] Lecture [ ] Tutorial [ ] PBL [ ] Practical class
16. Which component of third year science do you find most interesting?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
17. Which component of science do you find most relevant:
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
18. Which component of science do you find most difficult?
    [ ] Anatomy & Physiology [ ] Microbiology [ ] Chemistry & Physics [ ] Pathophysiology
    [ ] Pharmacology
19. How often do you read a science textbook?
    [ ] daily [ ] weekly [ ] monthly [ ] occasionally [ ] never
20. Do you borrow science books from the university library? [ ] No [ ] rarely [ ] sometimes [ ] regularly
21. I have purchased/borrowed the following science texts:

_____

_____

22. Before you started the BN course, which of the following statements best described your perception of science? *(You may tick more than one)*
    [ ] Important for medical advances [ ] Interesting and relevant
    [ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

23. Being in the third year of the course, which of the following statements best describe your perception of science? *(You may tick more than one)*
[ ] Important for medical advances [ ] Interesting and relevant
[ ] Easy [ ] Manageable [ ] Difficult [ ] Boring

24. What grade do you **realistically** hope to obtain in the science units?
[ ] Pass [ ] Credit [ ] Distinction [ ] High Distinction

25. How much do you value the science units in the nursing program?
[ ] Highly value [ ] Value [ ] Do not value much [ ] Do not value at all

26. How well have the science units integrated with the nursing and clinical units you have studied?
[ ] Extremely well [ ] Quite well [ ] Not very well

27. Do you have or have you had any problems with your nursing science studies? [ ] Yes [ ] No
If yes, please specify the nature of problem/s _____

_____

_____

28. Do you think you will continue and complete the BN course? [ ] No [ ] Yes

For questions 29 to 38, please tick as appropriate:

	Strongly agree	Agree	Disagree	Strongly disagree
29. I feel that the nursing science units this year have kept me motivated				
30. I have learnt a lot in the science units				
31. I appreciate the relevance of science to nursing				
32. Nursing science studies have helped me understand English medical terminology				
33. I find it easy to use electronic technology for learning (computer, WebCT intranet, and internet)				
34. I am finding it hard to juggle university studies and family commitments				
35. I am finding it hard to balance university studies and work commitments				
36.Teaching staff are supportive and respond to my learning needs				
37. I believe that progress in English language would help me with my studies *Please tick if not applicable* [ ]				
38. I participate in courses/workshops to improve communication skills				

39. Any additional comments _____

_____

_____

_____

_____

Your participation in this questionnaire is greatly appreciated – Thank you!

Appendix D

Summary of Trails Validity Process

Appendix D: Summary of Trails Validity Process

Nov 2004	Recognition of need for this study: Shortage of nurses, increased enrolments in BN programs, changing tertiary environment (student diversity). Development of pilot study methodology and research instruments.
Dec 2004	Preparation and submission of application for Ethics Approval.
Jan 2005	Extensive literature review to develop trial questionnaire (Appendix B) and to make study unique and valuable.
Feb 2005	Attended a workshop "Introduction to EndNote 7.0 for Windows" (at ACU library) to learn how to use the reference storage and management software package.
Mar 2005	Initial pilot questionnaire survey trialed by 20 first year BN students at ACU. Analysed survey responses and made minor changes (included an open-ended question requesting additional information and provided space for free text response).
May 2005	Administered modified pilot questionnaire survey (using 5-point Likert Scales) to first year nursing science students at three university campuses in Sydney (156 student participants at Campus A, 55 at Campus B and 27 at Campus C).
Jun 2005	Analysed pilot survey data. Determined that the "neutral" response (Likert scale) was used too frequently by students, increasing uncertainty in the data.
Aug 2005	Developed a 4-point Likert scale for the main study Questionnaire (Appendix C); the midpoint of "neutral" omitted. Administered first Year 1 questionnaire survey (Appendix C1).
Nov 2005	Attended Effective Teaching and Learning Conference "Challenging Issues for Teaching & Learning in the 21st Century" (University of Queensland, St Lucia, QLD, 3-4 November 2005) to gain insight in to issues related to teaching and learning, and the context of research. Attended workshop "Using EndNote with Databases and Catalogues" (at ACU library) to learn advanced features of EndNote software.
Dec 2005	Wrote-up results of pilot study and submitted to a journal for external review prior to commencing main part of study.

Mar 2006	Journal reviewers and editors recommend inclusion of student discussions in the form of focus groups in the study; permission sought from HREC (ACU) for inclusion of student discussions in research design. Ethics approval granted.
May 2006	Literature review indicated that numbers of male students entering nursing courses in Australian universities was increasing despite male numbers in medicine remaining steady or decreasing. Obtained enrolment information from universities in NSW for a comparative study on numbers of males and females commencing nursing and medicine.
Jun 2006	Attended workshop: "Introduction to SPSS" at University of Western Sydney (NSW) to develop skills in statistical analysis of quantitative data. Presented "Pilot study of Nursing student transition to university" at ANZAME & APFM Conference "Fill the Gaps" (Gold Coast, 29 June 2006). Presentation at this conference stimulated peer discussion to identify areas of further investigation.
Aug 2006	Administered second questionnaire survey to Year 1 (Appendix C1) and first survey to Year 2 cohorts (Appendix C2).
Apr 2007	Based on preliminary analysis of data, incorporated a question in the survey, requesting hours per week spent in off-campus study and in paid employment (see Q7). This allowed assessment of level of students' commitment to study and work. Developed paper (based on pilot study) further by incorporating suggestions made by the reviewer such as a detailed account of difficulties encountered by mature-aged and international students, and submitted the revised paper for publication in Focus on Health Professional Education. Administered first questionnaire survey to Year 3 cohort (Appendix C3). Conducted first focus group discussion session with Year 1 students – this was on advice of reviewers of paper submitted for publication. (This first focus group session was a valuable learning experience.) Following review and reflection, decided to implement a numbering system for identification and transcription purposes and to follow various responses of a given participant. Each

participant was allocated a number (Voice No. 1 up to 10), which he/she was asked to state prior to giving a response.

Conducted focus group discussion session with Year 3 students.

Commenced one-to-one student interviews for Years 1, 2 and 3 students.

Jun 2007

As an academic, observed struggling group of students repeating a second year science unit (offered as an intensive, short course in Winter School). A questionnaire survey (Questionnaire 2 is given in Appendix E) and focus group discussion session were conducted in order to gain a better understanding of the specific needs of these students.

Jul 2007

Administered questionnaire surveys to Year 1 and Year 2 students.

Attended a two-day workshop "Qualitative data analysis with NVivo (version 7)" (at Research Farm, Bowral, NSW) in order to learn how best to manage and analyse qualitative data from student discussions.

Conducted a focus group discussion with Year 1 and Year 2 students.

Conducted a focus group session with Year 1 male nursing students upon realising the need to further research issues (such as isolation, study preferences and practices) concerning the growing numbers of male nursing students.

Aug 2007

Included an option in Q8 in survey to clarify responses between student's first career choice and previous occupation.
Original question:
Was nursing your first career choice?
[ ] Y [ ] No (first career choice was_____)

Revised question:
Was nursing your first career choice?
[ ] Y [ ] No (first career choice was_____)
Previous occupation (if any): _____

Added a check-box for "n/a" option for Q37 to clarify between "not applicable" and the Likert scale responses.

Upon noticing a consistently low attendance of BN students at lectures (which affected the participation rate in surveys), a short study was planned and conducted to monitor attendance at lectures of nursing and science units across Years 1, 2 and 3.

Sep 2007	Orally presented "A three year review of first-year Nursing students' perceptions and experiences while studying science" at ANZAME Conference "Linking Learners and Leaders" (Canberra, 12-15 September 2007). The presentation stimulated interest amongst the delegates and led to discussion about various student-related issues. The conference facilitated communication between educators in the health professions, and increased awareness of links between various teaching styles used by educators and the learning strategies utilised by students.
Oct 2007	Conducted a focus group discussion with students repeating a second year science unit to enable comparison/support of data of earlier study (Winter School, June 2007) on second year students repeating a science unit.
Nov 2007	Carried out a comparability study on the questionnaire data of the three first year cohorts by using the Chi-Squared test.
Apr 2008	Conducted second study on Year 3 cohort: questionnaire survey, focus group discussion and one-to-one interviews.
Jul 2008	Orally presented "Men in Nursing: an overview of the backgrounds, experiences and expectations of male first year students at a Sydney university" at ANZAME Conference "Practice, scholarship & research in health professional education" (UNSW, Sydney, 10-13 July 2008). Orally presented a conference research paper entitled "A snapshot analysis of three successive cohorts of first year Nursing students at a Sydney university - How well do we know our students?" *at ANZAME Conference "Practice, Scholarship & Research in Health Professional Education" (UNSW, Sydney; 10-13 July 2008).* Attendance at this conference was beneficial in terms of peer discussions on issues related to student diversity that impact on learning and teaching, and networking with other researchers. This facilitated a better insight into students' diverse learning needs and various issues affecting male nurses.
Aug 2008	Conducted third study on Year 2 cohort: questionnaire survey, focus group discussion and one-to-one interviews. Conducted final study on Year 1 cohort: focus group discussion and one-to-one interviews.
Sep 2008	Presented a poster "The learning preferences of first year BN students" at the 13th National Nurse Education Conference "Clinical Professions Education: a bridge to quality, flexibility and

	diversity" (Sydney, 9-11 September 2008). The delegates attending the conference endorsed what I was reporting.
Nov 2008	Orally presented a revised version of "Men in Nursing" at the First Learning and Teaching Seminar Program (Faculty of Arts & Sciences; presented across six campuses of ACU on 20.11.08 by videoconference). There was no questioning of data at the end of presentation – this was viewed as confirmation that analysis tools were working well and the data stood up to peer scrutiny.
	Carried out a comparability study on the questionnaire data of the three second year cohorts by using the Chi-Squared test.
Apr 2009	Conducted third study on Year 3 cohort: questionnaire survey, focus group discussion and one-to-one interviews.
Jun 2009	Orally presented "What teaching and learning methods do continuing nursing students consider most effective?" at ANZAME Conference "Bridging Professional Islands" (UTAS, Launceston, 30 June - 3 July 2009). Conference discussion around this topic encouraged the researcher to review focus group information, which led to better interpretation of results.
Jul 2009	Presented a poster "Review of undergraduate nursing students' changing perceptions towards science at different stages of their degree" at ANZAME Conference "Bridging Professional Islands" (University of Tasmania, Launceston, TAS, 30 June - 3 July 2009).
	Attended HERDSA Conference "The Student Experience" (Charles Darwin University, Darwin, NT, 6-9 July 2009). Attendance at this conference confirmed that study results corresponded well with other current work.
Aug 2009	Conducted final study on Year 2 cohort: focus group discussion and one-to-one interviews.
Nov 2009	Orally presented a paper entitled "Male nursing students' expectations, experiences and social justice issues" at the "Symposium on Learning, Teaching and Social Justice in Higher Education" (ACU, Melbourne, 18 November 2009).
	Co-presented a paper entitled "Academic guided peer support for struggling first year students" at the "Symposium on Learning, Teaching and Social Justice in Higher Education" (ACU, Melbourne, 18 November 2009).
	This symposium presented an opportunity for listening to presenters, and presenting to an audience, comprising

	professionals in diverse disciplines across the arts and sciences. Hence, it was a different forum from medical education conferences; presentation of findings of study stood up to scrutiny by diverse peers, who also showed enthusiasm about the future direction of the study. Furthermore, there was growing recognition of student needs as emerged in current study. To examine validity of survey data carried out comparability study on the three cohorts of Years 1, 2 and 3 using the Chi-Squared test.
Jan–Aug 2010	Further literature review. Writing up thesis.

Appendix E

Questionnaire 2 for Students Repeating a Year 2 Science Unit (Winter School)

Questionnaire 2 Winter School

1. I am: ☐ female ☐ male

2. Age: ☐ under 20 ☐ 20-30 ☐ over 30

3. Country of birth: _____ First language _____

4. I find it hard to manage university studies because of: *(tick as many that apply, and comment)*
   - ☐ family issues _____
   - ☐ work issues _____
   - ☐ language difficulties _____
   - ☐ difficulties learning science _____
   - ☐ not motivated to study _____
   - ☐ poor time management _____
   - ☐ poor teaching _____
   - ☐ other reason(s) _____

5. How many hours do you work (paid employment) per week?
   ☐ 0 hrs ☐ 1-7 hrs ☐ 8-14 hrs ☐ 15-21 hrs ☐ 22-35 hrs

6. During regular semester, how many hours do you study at home per week?
   ☐ 0 hrs ☐ 1-7 hrs ☐ 8-14 hrs ☐ 15-21 hrs ☐ 22-35 hrs

7. Which of the following strategies would help you to study science units?
   (tick as many that apply)
   - ☐ Preliminary reading before class
   - ☐ Reading all course notes (lecture, tutorial, practical *etc*) several times
   - ☐ Reading text books (including articles from journals, internet *etc*)
   - ☐ Asking questions during class
   - ☐ Writing supplementary notes (*eg* as dot points)
   - ☐ Study together with other students (*ie* group effort)
   - ☐ Practise questions (*ie* from past papers)
   - ☐ Other *(please specify)* _____

8. Have you ever had: *(tick as many that apply)*
   a deferred exam in the past? ☐ No ☐ Yes If yes, how many times? _____
   to repeat a science unit? ☐ No ☐ Yes If yes, how many times? _____
   to repeat a non-science unit? ☐ No ☐ Yes If yes, how many times? _____

9. Do you think you will pass the current science unit? ☐ No ☐ Yes *If yes, answer Q10*

10. What contributed to your potential success in passing this Winter School unit?

_____

_____

_____

_____

_____

Please continue on the other side for further comments *PTO→*

11. Any other comments

Your participation in research is much appreciated – Thank you!

Appendix F

Focus Group Discussions
- List of Questions

- General questions
- Questions asked in discussion with male nursing students
- Questions asked to students repeating a science unit

Focus Group Discussion: list of questions

General questions:

How do the science units compare or fit in with other nursing or clinical units in your course? Is there a good integration of science?
What difficulties did you have in your study of science? How did you cope with any difficulties that you experienced?
In what ways can learning science be made easier and more interesting?
What strategies do you use to learn the difficult topics in science?
How valuable is science to nursing practice....can nursing practice survive without science?
What is your experience of learning science during the past 3 years?
After your first and second year experiences, did you have to make any, or many, changes or adaptations to the way you study?
Which of the teaching modes in science did you find most effective or useful?
Did your perspective of need for science change at all as you progressed through the course?
Any comments about the best thing and the worst thing about learning science?
Any additional comments, suggestions or concerns?

Questions asked in discussion with male nursing students:

What motivated you to choose nursing?
What is your experience of university life and of nursing study?
What was your perception of nursing studies before you started the course, and what is your experience of first year of the course?
What is your experience of transition to university studies: did you have to make any or many adjustments to settle in study this semester?
Which teaching mode/s do you enjoy most and what learning strategy or strategies work for you?
Why do students miss lectures and other classes?
What grade do you expect to obtain in the science unit?
Would you comment on being a minority in a female dominated cohort?
What is your perception regarding the role of men in nursing?

Questions asked to students repeating a science unit:

Why do you think you failed the science unit?
What could have prevented you from failing?
How can we help you to pass science-based units?

Appendix G

Information Letter and Consent Form

Information letter & Consent form
(for questionnaire survey)

AUSTRALIAN CATHOLIC UNIVERSITY

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Information Letter to Participants

Title of Project: **Evaluation of nursing students' academic expectations, perceptions and experiences of science at different stages during their undergraduate studies**

Principal Supervisor: Dr Kathy Robinson

Co-Supervisor: Dr Sharon Hillege

Student Researcher: Mr Hemant Mehta

Dear Participant,

You are invited to participate in this pilot study of student transition to university. As part of the university's research program, this investigation aims to evaluate student expectations, perceptions, and experiences throughout their undergraduate years. This study will focus on how students' perceptions may change during the course of the Bachelor of Nursing degree, how students evaluate different teaching strategies, and what international students perceive as their special needs. This will enable strategies to be developed and implemented to attempt to satisfy the students' needs and to enrich learning experiences at ACU National.

Participation in this research project is voluntary. You can withdraw from the study at any stage without giving a reason. Confidentiality will be maintained during the study and in any report of the study. All participants will be anonymous. Individual participants will not be able to be identified in any reports of the study, as only aggregated data will be reported.

If you have any questions about the project, before or after participating, please contact the Principal Supervisor, Dr Kathy Robinson, on telephone number 02 9953 3126 in the School of Psychology, MacKillop Campus at the Australian Catholic University, Edward Street, North Sydney NSW 2059. Before commencing, you will have the opportunity to ask any questions about the project

This study has been approved by the Human Research Ethics Committee at Australian Catholic University. In the event that you have any complaint or concern about the way you have been treated during the study, or if you have any query that the Student Researcher and Staff Supervisor have not been able to satisfy, you may write to:

Chair, Human Research Ethics Committee
C/o Research Services
Australian Catholic University
Locked Bag 2001
STRATHFIELD NSW 2135 Tel: 02 9701 4093 Fax: 02 9701 4350

Any complaint will be treated in confidence and investigated fully. The participant will be informed of the outcome.

If you are willing to participate please sign the attached informed consent forms. You should sign both copies of the consent form and keep one copy for your records and return the other copy to the researchers. Your support for the research project will be most appreciated.

Yours sincerely,

Mr Hemant Mehta : _____ Date: _____
Student Researcher

AUSTRALIAN CATHOLIC UNIVERSITY

Australian Catholic University
Brisbane Sydney Canberra Ballarat Melbourne

Consent Form

COPY FOR PARENT/GUARDIAN TO KEEP

Title of Project: **Evaluation of nursing students' academic expectations, perceptions and experiences of science at different stages during their undergraduate studies**

Principal Supervisor: Dr Kathy Robinson

Co-Supervisor: Dr Sharon Hillege

Student Researcher: Mr Hemant Mehta

Parent/Guardian Consent

I ..... (*the parent/guardian*)
have read and understood the information provided in the Information Letter to Participants. Any questions I have asked have been answered to my satisfaction. I agree that my child nominate below may participate in this activity, realising that I can withdraw my consent at any time. I agree that research data collected for the study may be published or provided to other researchers in a form that does not identify my child in any way

Name of Parent/guardian: .....
(block letters)

Signature: ..... Date: .....

Name of child: .....

Child Assent

I ..... (*the participant aged under 18 years*)
understand what this research project is designed to study student transition to university. What I will be asked to do has been explained to me. I agree to take part in the project, realising that I can withdraw at any time without having to give a reason for my decision.

Name of child: .....
(block letters)

Signature: ..... Date: .....

Principal Supervisor: Dr Kathy Robinson
Signature: .....
Date: .....

Student Researcher: Mr Hemant Mehta
Signature: .....
Date: .....

Consent Form

COPY TO RETURN TO RESEARCHER

Title of Project: **Evaluation of nursing students' academic expectations, perceptions and experiences of science at different stages during their undergraduate studies**

Principal Supervisor: Dr Kathy Robinson

Co-Supervisor: Dr Sharon Hillege

Student Researcher: Mr Hemant Mehta

Parent/Guardian Consent

I .....(*the parent/guardian*)
have read and understood the information provided in the Information Letter to Participants. Any questions I have asked have been answered to my satisfaction. I agree that my child nominate below may participate in this activity, realising that I can withdraw my consent at any time. I agree that research data collected for the study may be published or provided to other researchers in a form that does not identify my child in any way

Name of Parent/guardian: .....
(block letters)

Signature: ..... Date: .....

Name of child: .....

Child Assent

I ..... (*the participant aged under 18 years*)
understand what this research project is designed to study student transition to university. What I will be asked to do has been explained to me. I agree to take part in the project, realising that I can withdraw at any time without having to give a reason for my decision.

Name of child: .....
(block letters)

Signature: ..... Date: .....

Principal Supervisor: Dr Kathy Robinson

Signature: .....

Date: .....

Student Researcher: Mr Hemant Mehta

Signature: .....

Date: .....

Appendix H

Calculation of Yates' Correction for Continuity

Appendix H: Calculation of Yates' Correction for Continuity

In the three first year cohorts (2005-2007), there were a total of 916 female nursing students and 176 male students enrolled (n=1092). Of these students, 439 female students and 74 males completed and returned questionnaires (For "observed" samples, n=513). In order to check if the responding students were representative of the gender of enrolled students, chi-squared test was computed using the Yates' correction for continuity, using the following formula:

$$\chi^2 = \sum \left[\frac{(|O-E|-0.5)^2}{E} \right]$$

Calculation of "expected" numbers of students in the respondent sample:

Number of expected males (176 x 513) / 1092 = 83
Number of expected females (916 x 513) / 1092 = 430

$$\chi^2 = \frac{(|74-83|-0.5)^2}{83} + \frac{(|439-430|-0.5)^2}{430}$$

$$= 0.8705 + 0.1680$$

$$\chi^2 = 1.039 \quad \text{(degrees of freedom = 1)}$$

The corrected value of 1.039 is less than the tabulated critical value of 3.84 at p = 0.05. Therefore, it is concluded that there is no significant difference in the distribution of gender between the sample of survey respondents and the sample of enrolled students.

Appendix I

Publications, Conference Presentations and Posters Associated with this Work

Publications Associated with this Work

Mehta, H & Robinson, K 2010, 'Male nursing students' expectations, experiences and social justice issues', in *Learning, Teaching and Social Justice in Higher Education,* eds N Riseman, S Rechter & E Warne, Australian Catholic University, Melbourne, pp. 233-244. <http://www.msp.unimelb.edu.au/index.php/LTSJHE/index>.

Robinson, K, Mehta, H, et al. 2010, 'Academic guided peer support for struggling first year students', in *Learning, Teaching and Social Justice in Higher Education,* eds N Riseman, S Rechter & E Warne, Australian Catholic University, Melbourne, pp. 189-199, <http://www.msp.unimelb.edu.au/index.php/LTSJHE/index>.

Mehta, H, Robinson, K & Hillege, S 2008, 'Expectations, perceptions and experiences of first year students enrolled in nursing and/or midwifery courses at three NSW universities', *Focus on Health Professional Education: A Multi-Disciplinary Journal,* vol. 10, no 1, pp. 11-25.

Mehta, H, Robinson, K & Hillege, S 2008, 'A snapshot analysis of three successive cohorts of first year Nursing students at a Sydney university - How well do we know our students?', *Conference research paper: ANZAME Conference 'Practice, Scholarship & Research in Health Professional Education', University of NSW, Sydney, 10-13 July 2008.* <http://anzame.iamevents.com.au/Presentations/presentations.html>.

Conference Presentations Associated with this Work

(Presenting author/s underlined)

Mehta, H & Robinson, K 2009, 'Male nursing students' expectations, experiences and social justice issues', *Learning, Teaching and Social Justice in Higher Education Symposium,* Australian Catholic University, Melbourne, 18 November 2009.

Robinson, K, Mehta, H, Hendrick, L, et al. 2009, 'Academic guided peer support for struggling first year students', *Learning, Teaching and Social Justice in Higher Education Symposium,* Australian Catholic University, Melbourne, 18 November 2009.

Mehta, H & Robinson, K 2009, 'What teaching and learning methods do continuing nursing students consider most effective?', *ANZAME Conference 'Bridging Professional Islands', University of Tasmania, Launceston, 30 June-3 July 2009.*

Mehta, H & Robinson, K 2008, 'Men in nursing', *ACU Faculty of Arts & Sciences Videoconference 'Learning and Teaching Seminar Program', Australian Catholic University, Sydney, 20 November 2008.*

Mehta, H, Robinson, K & Hillege, S 2008, 'A snapshot analysis of three successive cohorts of first year Nursing students at a Sydney university - How well do we know our students?', *ANZAME Conference 'Practice, Scholarship & Research in Health Professional Education', University of NSW, Sydney, 10-13 July 2008.*

Mehta, H, Robinson, K 2008, 'Men in nursing: an overview of the backgrounds, experiences and expectations of male first year students at a Sydney university', *ANZAME Conference 'Practice, Scholarship & Research in Health Professional Education', University of NSW, Sydney, 10-13 July 2008.*

Mehta, H, Robinson, K & Hillege, S 2007, 'A three-year review of first-year nursing students' perceptions and experiences while studying science', *ANZAME Conference 'Linking Learners and Leaders', Canberra, 12-15 September 2007.*

Mehta, H, Robinson, K & Hillege, S 2006, 'Pilot study of nursing student transition to university', *ANZAME Conference 'Fill the Gaps', Gold Coast, 29 June 2006.*

Posters Associated with this Work

(Presenting author underlined)

Mehta, H 2009, 'Review of undergraduate students' changing perceptions towards science at different stages of their degree', *poster 53: ANZAME Conference 'Bridging Professional Islands', University of Tasmania, Launceston, 30 June-3 July 2009.*

Mehta, H & Robinson, K 2008, 'The learning preferences of first year BN students', *poster 8: 13th National Nurse Education Conference 'Clinical Professions Education – a bridge to quality, flexibility and diversity', Olympic Park, Sydney, 9-11 September 2008.*